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Cover Story

Photograph by David Allison

Pterois lunulata is the least commonly imported species of Lionfish. It is, of course, just as venomous as its relatives, all of which belong to the sub-family Pteroinae of the family Scorpaenidae, the Rock or Scorpionfishes. All the Lionfishes are slow-moving predators which, while not being particularly aggressive, will, nevertheless, swallow any other fish which is small enough to be swallowed. Generally speaking, all species are inoffensive towards humans. Injuries from the stiff, venomous spines of the dorsal fin, therefore, only occur rarely and, when they do, are usually the result of carelessness on the part of the aquarist. Be that as it may, Lionfish must be always handled with great care.



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TAKE A PAIR OF SPARKLING KRIBS

By Amanda Grimes

I must admit to having sat over a silent typewriter for three days in an effort to present to you a series of events that took me from a plan to breed Kribensis (*Pelvicachromis pulcher*) to becoming the proud owner of prize-winning Zebra Danios (*Brachydanio rerio*). The problem is, I learnt so much in the transition that the intention and the result might well obscure the equally-important incidentals along the way. This dilemma has now been solved by one word: Serendipity—the faculty of making happy and unexpected discoveries by accident. Fatticus, my Bronze Corydoras, had this faculty and it would seem that I, and indeed anyone involved in fishkeeping, share it with her.

The plan was simple enough. Take a pair of sparkling Kribis, introduce them to a two-foot tank, furnished tastefully with flowerpots, hollowed-out coconuts, plant and mature water and, after three days, at Gas Mark 6, a happy family scene. As in all good recipes, there is a 'meanwhile'. In accordance with my grand plan, the 'meanwhile' should have been the optimistic preparation of a good, smelly bottle of Infusoria. It was here that serendipity intervened. . . .

'Meanwhile', I came down with a vicious attack of tonsillitis that left me weak and gasping for breath. Confined to bed, I handed over the routine maintenance of the community tank to my boyfriend. The external box-filter was in need of cleaning and in the process, Colin, who is not short-sighted like me, spotted some tiny fry. He put the untouched filter back on the tank, re-connected the air supply and set about making a tiny glass tank. When it was ready, he syphoned the fry into it and

floated it in the top of the community tank, adding an airstone. He and my sister fed them liquid food till I was up and about—then he went off fishing for a few days.

Anxious to make up for lost time, I set about cleaning the cover glasses and cutting back the plant in the main tank. The Kribis, by the way, were busy spitting gravel and displaying, so I left their tank alone. It was when I was putting the clean cover-glasses back on the tank that one of them struck, then suddenly freed itself and slammed into the fry tank, badly cracking it. Fetching a glass dish from the kitchen, I tipped the fry into their new home, changed some of the water and turned my attention to the box filter. There were more fry in it! When I'd added them to the bowl, I took a long, hard look at the tank . . . and found the parents. The Zebra Danios were spawning like it was going out of fashion.

What was I going to do with the fry? The Kribensis had the spare tank and I couldn't afford another tank and the equipment to set it up. The floating nursery presented feeding and water problems and we were already losing some of the fry. Within the week, we'd lost them all. My fault, again! I was hoovering the main tank when the airline got tangled round the bowl and upset it. I grabbed for the bowl and the fish grabbed for the fry. To add insult to injury, the Kribis were still spitting gravel—I reckon they were a new variety, *Pelvicachromis pulcher* Blue Circle.

In desperation, I checked the box filter. Oh, happiness, oh, glory—more fry. I was syphoning them into the bowl when the phone rang. It was

Colin, to say he'd found an advertisement in the local paper, offering a secondhand Eheim power filter for £15. I threw caution to the wind, dug into the money I'd put aside for the bills and bought it. This was the answer to everything.

We'd longed for a power filter, as the box filter was insufficient for the community tank and had to be cleaned at least once a week. As a bonus, the box filter would now be free for the fry. We would remove the carbon and wool, set it up on the side of the Kribis tank and the Danios would have constantly changing water, aeration and natural Infusoria. Even better, the new fry were so small that, once the Kribis had spawned (Oh, ye of little faith!), both lots of fry could share the tank.

The power filter was duly installed and the Danio fry began their new life in the Kribensis tank. We relaxed, problem solved—happy fish, happy fishkeepers. Two days later, panic stations. One small Danio, sailing blissfully around in the Kribis tank. Above, the great escaper; below, the tunnel king. How?

Having restored Steve McQueen to his filter, we sat and thought it through. We'd given the Kribis *Daphnia* in the evening; and when we feed *Daphnia*, we turn the filters off to stop that pricey food going to waste. McQueen must have swum down one of the syphon pipes in the absence of any opposing current. Fine, no more *Daphnia*. End of subject.

"What are those little fish in the Kribis tank?" a friend asked, several days later.

"Salmon," I said, through clenched teeth, reaching for the glass bowl.

They stayed in the bowl, floating in the community tank, while Colin and I had a conference. Then we collected the nets and bags, transferred J.C.B. and his consort to the community tank and gave the Danio fry the freedom of the tank.

"How are the Kribis coming on?" our friend Bill Hastings asked, several weeks later. I nodded towards the tank. Bill laughed and then looked closer.

"You know, they're really good-looking fish. Where did you breed them?"

"In the filter," I said flatly.

"Hm, it's amazing what you can find in there. I always check mine for fry."

"Amazing," I repeated, without interest.

"I'm showing some fish at Haringey on Sunday. It's an Open Show. Would you like me to enter them in the Breeders' Class?"

"Danios!" Well, they're two a penny, aren't they? "Why?"

"Because they're winners. No kidding."

Would you credit it? They won third prize! I sat down in front of the main tank and showed the green rosette and certificate to the male Kribensis.

"This could have been yours," I told him.

A spatter of gravel hit the front glass.



A normal (1) pair of spawning Kribis

AN OCTOPUS IN THE FAMILY

Unusual invertebrates are not uncommonly found among imported consignments of 'living rock' but Tony Jenno regards a Common Octopus as his prize find

Some years ago, when I was active in the importation of tropical marine invertebrates and fish, we received many surprise 'presents' from abroad, most of which I am sure were included in the shipments quite unintentionally. Many of the more unusual invertebrates collected in this way came in the boxes of so-called 'living rock' sent from Singapore. This natural material is not cultivated in any way by the exporter, but is simply chopped off the local reef, boxed up and shipped out. It is, therefore, liable to contain anything and everything, and frequently very surprising inclusions were found.

Many tropical invertebrates can live for quite long periods out of water as long as they are warm and wet. Polystyrene fish-boxes with lids create an ideal environment for invertebrate travel. 'Living rock' has a crumbly, coral-like structure which is not in itself very ornamental, but because of its much-perforated composition is a favoured habitat for all kinds of stationary and mobile marine life. So anything which lives in a hole or attaches itself to a rock is likely to be found.

When unpacking such shipments we soon learned to be careful. Many sea-

creatures sting or nip and some generate skin irritations. Others can be really dangerous. The Mantis Shrimp (Stomatopoda) is an example of a super-predatory crustacean which can make a serious wound if it gets hold of a human finger. Therefore, newly-imported populated rocks should always be carefully examined and, furthermore, the aquaria in which they are housed should be watched carefully for some time afterwards, in case unwanted inhabitants are present. Bristle Worms (Polychaeta), for instance, have been found up to 18 inches long.

The best way to deal with newly imported 'living rock' seemed to be to rinse it off with some old salt water retained for this purpose (it contains much mud, as usually supplied) and then to place it in a large unlit aquarium, well spread out over a bare glass bottom. Many creatures would then leave the rock to forage or, perhaps, to find less mobile homes. At the same time the rocks would 'blossom' as their stationary inhabitants resumed their usual underwater attitudes and it could then also be seen which way was up. After a few days close examination the rock could then be reasonably safely installed in a display aquarium.

The usual articulated entities obtained

in this way were crabs of various kinds and inevitably, if left together, they would proceed to eat each other. The crustacean world is a very competitive place. Many invertebrate aquariums end up with one large crab which has eaten or destroyed everything else.

My prize find in this way was an Octopus. At first sight it was a gungy black-brown blob in a hole in a piece of rough dead coral. It looked like a closed anemone out of the water, but once immersed it began to move and was very soon unmistakable. When fully stretched it measured about ten inches from tip to tip but the body was only a small lump about an inch or so across. Colour was mostly a dull brownish-green with no particular markings.

Such an unusual acquisition was naturally given its own aquarium straight away. The tank was furnished with a large central piece of rock with plenty of sizeable holes, a coral-sand bed, and an undergravel filter. The Octopus seemed happy enough and soon settled down in its new home. It ate various mollusc foods and pieces of fish. Shells were no problem to it and so cockles were an easily-obtained food which seemed to be particularly favoured. Sometimes its colour would change to a light sandy (camouflage?) shade, but generally it was mainly as before. It became more adventurous with time and soon began to wait at the top corner where the food was put in. Knowing the likelihood of its climbing out (but not in again), a very heavy cover glass had been fitted with a couple of bricks on top for good measure, but at feeding times these were naturally removed and the Octopus got into the habit of exploring above the water line with its tentacles. It could be seen how it might work its way through the smallest of openings.

A sudden development

Eventually we were able to feed it by hand and it would wrap a tentacle around a finger, given half a chance. At this stage, which was only a few weeks after its arrival, we were congratulating ourselves on what was thought to be a major success, when suddenly things changed. One morning whilst doing the rounds of the display aquaria I noticed something stuck to the glass in the top corner of the aquarium, where feeding usually took place—on close examination this proved to be a cluster of elongated liquid-filled sacs which could only be eggs. They were firmly attached to the glass and the Octopus was near them in a relaxed posture. It was very dark in colour.

Reading up on the subject showed that an Octopus habitually guards and oxygenates the eggs. We naturally had high hopes for a tankful of babies for the world to come and see, but that was not to be. The first immediate consequence of the exercise was that the mother no longer ate, nor in fact took any notice of anything other than the eggs. It had ceased to exist except as a parent. This,

I found out, is normal behaviour and the female Octopus invariably does not survive after the eggs hatch.

That unhappy theory proved to be the case. The contents of the eggs developed over several days from a whitish liquid to a recognisable embryo. There appeared to be two very prominent eyes watching, as we thought, our every movement. After about nine days the eggs were found burst one morning, indicating that they had hatched, but of the young there was nothing to be seen. They would, of course, be so small as to be practically invisible anyway. The next day the

Octopus died. What initially promised to be an exciting experience turned out in the end to be interesting enough, but sad. The young could not survive either in an artificial environment without a plankton layer.

As to keeping the Octopus generally, there were no problems at all. It would always have had to be kept alone, but at the usual temperature and density of a tropical marine aquarium it was very hardy and active. It quickly became tame and ate everything offered until it laid the eggs. It seemed intelligent. I was convinced at the time that it knew me

personally, although this was probably not so. Never once did it squirt its defensive 'ink' into the water, which was a blessing as this substance is said to be extremely polluting. Perhaps this action only occurs as a last resort.

I found the Octopus to be impossible to photograph. It was so light-sensitive that continuous illumination for available-light photography was impossible and I dared not use flash in case the shock triggered off the ink-squirting. I did, however, succeed in photographing the sequential development of the eggs, some of which shots are included here.

Below: A cluster of elongated liquid-filled sacs: the eggs when newly laid

Right: Nine days after being laid, the eyes were visible Bottom: An adult Octopus preparing to swim off



LAURENCE E. PERKINS

UNUSUAL COLDWATER

Where the coldwater aquarium is concerned, if you take away *Egeria densa* and *Lagarosiphon major*, which are the only species that most people have ready access to, any other species is unusual. However, the range of plants suitable for unheated aquaria is much larger than the public are aware of. Ignoring the 'long day' plants which comprise most of our native species, which live only a short while under artificial light, we are still left with a large number of aquatics from warm temperate regions of the world which do well.

Foreground Plants

These diminutive species are much sought after by keen coldwater aquarium keepers. Two plants which form low growing rosettes, reach about 4 in. in height and 6 in. in diameter are *Samolus parviflorus* and *Armoracia aquatica*.

Samolus or Water Cabbage is a pale green plant with long white roots. It requires clean water and a temperature lying between 55-68°F. One can increase one's stock in three ways. First, old large plants can be divided up into several smaller plants. Secondly, if the plants are grown in shallow pans in sunlight, they throw up tall flower spikes which produce seed freely. These old flower spikes should not be discarded as, bent over into the water, they will produce numerous baby plantlets at every node, offering yet another method of obtaining new plants. *A. aquatica*, in its typical growing form, produces rosettes of dark green strap-like leaves. These are stiff and brittle in texture. However, this species is almost chameleon-like in its growing forms. As the season progresses, the new leaves become progressively more divided, until finally they resemble those of parsley. Flowering occurs at this stage if the water level is low enough.

The genus *Hydrocotyle* has two species ideally suited to unheated aquaria. *H. vulgaris* or Umbrella Plant has circular leaves born on short stalks. It grows some 2 in. high and increases rapidly by runners under good conditions. *H. verticillata*, from North America, is similar but the leaves have frilled edges and it grows much larger producing floating leaves in tanks less than 12 in. deep and is thus more suited to the middleground.

Sagittarias are a very versatile group. There are species which can be used in any area of the aquarium. *Sagittaria pusilla* is a tiny species with grass-like leaves forming a turf about 1½ in. tall.

A somewhat similar plant is *Lilaeopsis novae-zelandiae* from New Zealand. However, this plant does not form a rosette but

instead produces individual leaves at intervals along a runner. It is very prolific and will form a turf about 3 in. in height under ideal conditions.

The Sweet Rushes or *Acorus* group have one variety ideally suited to foreground work. This is *Acorus pusillus*, the Dwarf Rush. The stiff, spiky leaves are arranged in a fan. They are dark-green and grow up to 6 in. high.

Middleground Options

Sagittaria subulata has the typical strap-shaped leaves of the submerged form of these plants. They are bright-green, up to 8 in. high (often smaller) and spread quickly by runners to form large colonies. *Vallisneria spirifolia*, Twisted Vallisneria, reaches a similar height and may be used in the same position. *Saxifraga cernua* or Lizards Tail has grey-green heart-shaped leaves on an ascending stem. It will grow to 10 in. tall under water and increases by underground stolons.

Sagittaria platyphylla, Giant *Sagittaria*, has leaves up to half-an-inch wide and 12 in. long but is often used in the middle-ground in deeper tanks. *Acorus gramineus variegatus* is, as its name suggests, a variegated Sweet Rush. Its leaves are striped in green and yellow and it grows about 10 in. tall. For specimen plants both of the Nuphars, *Nuphar luteum* from Eurasia and *N. japonicum* from Japan, cannot be surpassed. The leaves are translucent green, reaching several inches in diameter. The plants grow from a sturdy, tuberous rootstock, which may need to be anchored down under a piece of slate until rooting has occurred.

Background Plants

Of the fine-leaved aquatics, *Myriophyllum elatinoides* from Australia is one of my favourites. The thin ascending stems are clothed in whorls of light-green finely divided leaves. It is a fast grower and needs regular trimming.

Cardamine lyrata, the Japanese Cress, is a delicate little plant with pale-green slightly-rounded leaves borne oppositely on thin, wiry stems. Whilst a vigorous grower it should not be used with boisterous fishes which will snap the stems.

Lymnobia mammillaria is a much more robust oxygenator, and although a native plant, grows well in unheated aquaria with good light. *Hydrilla verticillata* closely resembles *Elodea* in its appearance but may be distinguished by the presence of a thin, red line which runs down the midrib. The last of my selections for the background is the Giant Rush, *Acorus gramineus* var: *intermedius*. This large plant can reach 15 in. high with leaves ½ in. in width. It is

excellent on account of the fan-shaped arrangement of the leaves for placing across corners to hide filters, etc.

For the Garden Pool

When planting the garden pool there is a tendency for many people to pick plants that are at their best early in the season. However, the flowering cycle is spread over seven months of the year and so one should choose plants which have a staggered flowering sequence plus attractive foliage so that they remain interesting throughout the season.

Ten years ago I imported an unnamed species of *Sagittaria* from Brazil. As it propagated very easily I introduced a few into an outside pool to test it for hardiness. Planted in one of my natural pools in mud they increased at an incredible rate. In the rich mud of the pond bottom they grew up to three feet high with arrow-headed leaves as big as saucers. The flower stems were clothed in inch wide flowers, white with orange centres. I believe it to be *S. chilensis* but this is open to question as I have never had it formally identified. However, it is a species I would thoroughly recommend to pool owners. The adult plants die completely in the winter but produce dozens of tubers which grow quickly into adult plants in the spring.

Moisture-loving plants are seldom planted by the average pool owner although all water-gardening books indicate how an area may be created by the side of the pool to cater for their special needs. Bog Primulas are important members of this fraternity. I have a lovely patch of *Primula florindae*, or Giant Cowslip as it is popularly known, growing by the side of the river at the bottom of my garden where it harmonises well with wild Willow Herb (*Epilobium angustifolium*). One of the first plants to sell out at the nursery is *Mimulus guttatus* which with its showy scarlet and yellow flowers will contrast well with the blue flowers of the Water Forget-me-Not (*Myosotis palustris*).

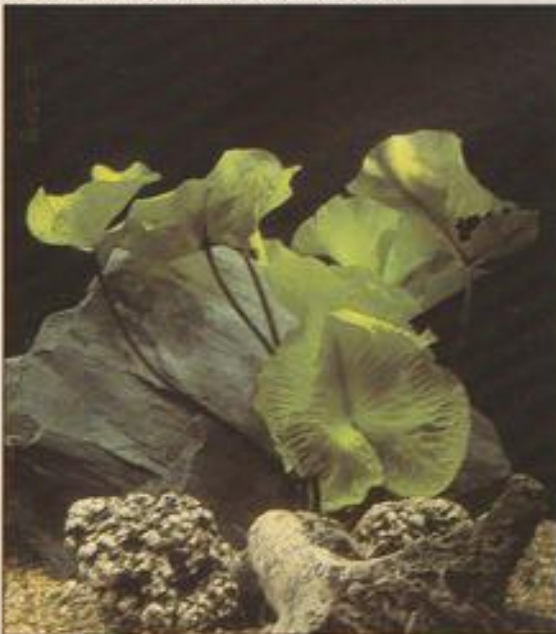
Many tiny pools one sees are swamped with growths of our native Water Lily, *Nymphaea alba*. Seldom does the pool owner realise that miniature water lilies are available for small, shallow pools. My own favourite for such situations is the Pygmy Yellow Lily (*N. pygmaea kelvola*). Although they develop later than their larger cousins, they are generally in bloom by mid-June and then continue to produce their sulphur-yellow 2 in. wide blooms freely until the autumn. As an added bonus the leaves are blotched and striated in purple. These miniature lilies should not be planted in water more than 12 in. deep.

WATER PLANTS

By
Barry James



Left, a favourite Lily for the small pond is *Nymphaea pygmaea helvola*. Right, despite needing regular attention *Myriophyllum elatinoides* is highly desirable



Left, *Nuphar luteum* is difficult to surpass as a 'middle ground' species. Right, *Acorus puzosii* is a good foreground plant for the coldwater aquarium

Photographs by Barry James

Tomorrow's aquarist

Results of our 'Koi Cart' competition

Sponsored by Rolf C. Hagen (U.K.) Ltd.

In April, we invited you to send us your cartoon ideas for a Koi Cart—and your response created quite a traffic jam in the

office! Not that we're complaining; T.A. readers are making a name for themselves when it comes to enthusiasm.

Our competition sponsors, Rolf C. Hagen (U.K.) Ltd., provided the following, very useful incentives, which the

lucky winners should find a welcome addition to their tanks:

First Prize

Floral 302 External Filter with twin inlets and outlets, full set of taps and maximum turnover of 222 gallons/hour, making it suitable for aquaria up to 6 ft. in length. Individual canisters inside the main filter canister allow the 302 to be adapted to a wide range of uses in both freshwater and marine aquaria.

Retail Value: £56.83

Second Prize

Hagen Aqua-clear 200 Powerhead with flow control up to 150 gals./hr. and 270° turn of flow facility to direct water stream as desired. This powerhead will fit all commercial airlifts from ½ in. to 1½ in., has an in-built Venturi attachment which can be 'switched' on for aeration and can be used both in freshwater and marine aquaria.

Retail Value: £15.53

Third Prize

Floral 42 Internal Filter with adjustable flow control up to 60 gals./hr. (suitable for aquaria measuring up to 3 ft.), and a Venturi attachment capable of working down to a water depth of 12 ins. Maximum stability is provided by a bottom-mounted motor.

Retail Value: £15.53

If you've been holding your breath for the past month, you can now come up for air! Here are the names of our prize-winning Koi Cart-oonists...

First Prize

Ian Peplow, 79 Charford Road, Bromsgrove, Wores.

Second Prize

Andrew Swindlehurst, 5 Pasture Close, Greenacres, Skipton.

Third Prize

Tim Stanbury, 2 Kennington Close, Thornhill, Cardiff.

Congratulations to our winners and commiserations to all those who put pen to paper only to be pipped at the post. Don't be discouraged—we have lots more competitions in the pipeline and they won't all be aimed at those who can draw on their artistic abilities!

In the meantime, we will publish the winning Cart-oons as soon as possible.

Beginners' Corner

The demand for livefood can sometimes exceed the supply; and if you are limited by your work or school activities to weekend shopping, you can often come home empty-handed. Whilst you can, of course, collect your own aquatic insects from the 'wild', you risk introducing unwelcome parasites into your aquaria. So why not try cultivating your own?

Andrew Grant, a regular contributor to this page, gives you the benefit of his experience:

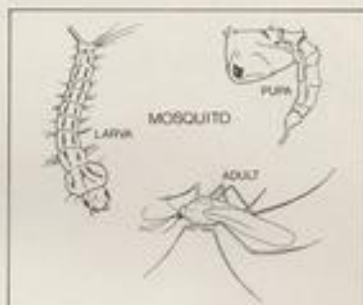
Four years ago, I collected some frogspawn and introduced it to my pond—well, more a puddle than a pond! Anyway, most of the tadpoles metamorphosed into small frogs and left in the autumn.

In the hope of some adults returning this year, I set up the pond again. Apart from the birds using it as a bath, I could see little activity until one day, at the end of April, as I bent down to empty the pond, something in the water caught my eye. It turned out to be the larva of a mosquito. I soon found many others, resembling hundreds of commas, punctuating the waterline.

I rushed indoors to fetch my net and jar, knowing they would make excellent food for my fish. Every scoop of the net produced hundreds of larvae—the jar was soon full. As soon as I dropped them into the aquarium, the fish went mad. At this time, however, the larvae were very tiny and many were missed by the fish, so I decided to let them grow.

By adding bread and leaf litter to the pond (to feed the micro-organisms on which the larvae thrived), I soon had larvae that were large enough and I went out every day to collect them, whatever the weather. I must have been quite a sight, paddling in the pouring rain!

As time went on, the larvae developed into pupae, and I was frantically stuffing the fish with them before they hatched, so that we wouldn't have a garden infested with mosquitoes!



Life cycle of the mosquito

It was about this time that the bloodworms appeared in the pond. Bloodworms are another kind of fly larvae, and are usually found in stagnant water. At first, a few worms appeared. However, when I accidentally caught a piece of bread I found it covered with bloodworms. Then, a few days later, I discovered large clumps of bloodworms. I could not find any reason for this curious behaviour.

After the worms had been fed to the fish, it seemed that there was no live food left. However, I found some more bloodworm larvae in their cocoons, which have the unfortunate appearance of a rabbit dropping. It appears that, just before pupation, the bloodworm makes a small cocoon with sand grains and other debris, in a similar way to caddis fly larvae. In a good season (or a bad one!—whichever way you look at it), you can get three generations of mosquitoes. So if you have room in the garden, leave out a container of a few gallons capacity, filled with water, and you will have a supply of livefood all through the summer. Fish appreciate good food, too, you know!

Andrew will shortly be receiving a copy of Dr. Neville Carrington's popular book *Maintaining a Healthy Aquarium* kindly donated to T.A. by Interpret Ltd.



BETTA BELLICA

By Steve Clark (Anabantoid Association of Great Britain). Photo: A. van den Nieuwenhuizen

This fish was first imported into Germany in 1913 but has not been seen recently, until shipped into this country from Malaysia as 'Green Jungle Fighting Fish'. It was first described by Sauvage in 1884. As many of the specimens collected at that time were in a state of decay, Regan noted a discrepancy concerning the ray count of the anal fin and this was confirmed by Weber and de Beaufort. They recorded the following: Dorsal fin I/10 (one hard spine and ten soft rays), Anal fin II/30-32 and 35 scales along the lateral line. The fish's body is cigar shape, hinting at its athletic prowess, and it is a good jumper. Emerald scales are laid on a yellow to dark brown background. This gives the appearance of iridescent rows of green scales. The unpaired fins are dusky brown red inlaid with a metallic green membrane and a golden outer edge. The dorsal and caudal fins are speckled black. In older males the pelvics are bright red with greenish tips and the head is mottled. Depending on her mood, vertical stripes can sometimes be seen on the female. The iris of the eye is green. Sexing this fish at adult size is relatively easy. The female has a more rounded dorsal and is smaller and less colourful. A mature male has extensions on the unpaired fins. The maximum overall length is about 4-3 ins.

The common name of 'Slim Fighter' refers to its physique, whilst its latin name means 'warlike'. Several reports indicate its pugnacity, although I have kept pairs alone in small quarters with no trouble.

Breeding

The only known spawning to date in this country, by Kevin Buckley, was at the surprisingly low temperature of 72°F, although one would suspect that 80°F would normally suffice. A tank measuring 24 in. x 18 in. x 6 in. was filled to a depth of 5 ins. with water at a pH of 6. A dimly lit location was chosen.

The male darkened and he blew a large bubble, approximately 9 ins. x 3 ins. and at least one inch deep. The typical breeding routine of all bubble-

nesting Bettas followed, climaxing with the male wrapping himself around his mate. The fertilised eggs sank and were collected by the male and placed in the nest. The fry hatched in 24 hours and were initially fed on Infusoria and, after a few days, on Brine Shrimp nauplii. The female was removed after spawning but the male was an excellent parent and remained with the young until they reached one inch, after only four weeks.

A Similar Species

A similar fish, *Betta fasciata*, has been known to the hobby since 1906. It was collected by a Mr. Iverson, in Sumatra, who passed the specimen to Regan. He recorded the new species along with his description of *Betta bellica*. Meristic data were nearly identical to *B. bellica* (with dorsal I/9-10, Anal II/30 and 34-36 scales in longitudinal series). It has the same tubular body as its cousin, the background colour being brown with neon green scales, although a velvet blue variation has also been reported. Shiny copper flecks are found on the dorsal and upper part of the caudal fin. Like *B. bellica*, at times the female displays two longitudinal lines parallel to the lateral line.

The name *fasciata* means striped, hence its common name. However, it is somewhat unfounded as it will not normally show the stripes unless frightened or preserved. It attains 4 ins. and is very active so a tight-fitting lid is essential.

A Reason for the Similarity

Betta bellica is found in the southern peninsular of Malaysia in a swampy part of the Kinta River, a tributary of the Perak. *B. fasciata* was first collected on the island of Deli, south of the western tip of Sumatra, although from other reports, it appears that they also inhabit dark waterholes in inland Sumatra. The distance between the habitats of the two species is about 1,000 km and, although this would appear to confirm the validity of the two species, another explanation may exist.

During the era known as the Palaeocene,

the present islands of the Indo-Australian archipelago were linked to the Asian continent and a shelf area, known as Sundaland, emerged. One major water-course drained the west and centre of Sundaland and its dismembered side branches became the present-day river systems when the polar icecaps melted to their present size and the water level rose. Malaysia became separated from Sumatra during this process and the higher ground of present-day Borneo and Java also remained. Molengraaf, the geologist, and Weber, the ichthyologist, concluded that the fish fauna of the rivers on the east coast of Sumatra was similar to that on the east coast of Borneo, probably due to the old connection of the rivers in the Sundaland period. Brittan in his study of Rasboras also pointed out how this affected the distribution of that genus. It may, therefore, be that during the Tertiary, one species of *Betta* inhabited the area of Sundaland in the area now known as Malaysia and Sumatra. When Sundaland was submerged it may have become isolated in two populations and this may account for the similarity of *Betta fasciata* and *B. bellica*.

These may be variations of one species, or, being isolated geographically, may have evolved into distinct species which can no longer successfully interbreed. They may, however, be only sub-species, so could *B. bellica* = *B. bellica malay* and *B. fasciata* = *B. bellica sumatras*?

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Readers write

Publication of our feature on Dr. Wood's report, 'The Exploitation of Coral Reef Fishes for the Aquarium Trade' (*A & P*, March, 1986) has stimulated a very healthy and interesting response from our readers. Here is a sample of the letters we have received so far. If you wish to contribute to this, or any other aquatic issue, drop us a line—we would be very pleased to hear from you.

Response from the Author

The Marine Conservation Society, who undertook the aquarium trade study, and the sponsoring organisations (World Wildlife Fund and the Fauna and Flora Preservation Society), were heartened to see *The Aquarist and Pondkeeper* taking an active interest in the report, and stimulating discussion on its findings. It can do nothing but help if problems are brought into the open and debated by all sides, and we feel sure that the aquatic hobby and conservation interests need not, and should not, be 'poles apart'. There is no reason why the two interests should be mutually exclusive. Indeed, the aquarist and the marine conservationist share common ground in gaining pleasure from watching living marine animals, and learning about them and their habits. However, for the conservationist, trade in living animals is only acceptable provided it does not result in over-exploitation and/or create environmental problems. In addition, although we are not a welfare organisation, we could not condone trade where mortalities are unacceptably high; partly for moral reasons (which surely everyone must agree with?) and partly because, for the wild-caught marine animals, high mortalities in captivity mean greater pressure on reef populations.

This brings me to a misunderstanding about mortalities which has arisen a number of times, and surfaced again in this feature. Mention was made of the fact that 'fish die anyway', and the question was asked, would the fish that die within six months 'have survived if left to mature and their own environment?'

Obviously, fish do die anyway, and many are preyed upon by other reef fish. However, this does not detract from the point that collection of fish for the aquarium trade is selective predation over and above natural predation. Not only do captured fish become unavailable to the reef food chain, they also cannot contribute to the reproductive effort of their species. Clearly, removal of fish for the aquarium trade could, just like any other fishery, adversely affect fish populations. Clearly also, the greater the turnover of fish in captivity, the more fish have to be collected as replacements. Thus the concern about high mortalities. When collectors admit, as they did in Sri Lanka, that fish populations have declined, then surely concern is wholly justified?

It is a shame that Keith Barraclough took exception to the title. Use of the word 'exploitation' was not intended to be provocative—just honest. The dictionary definition of 'exploitation' is 'to utilise for one's own ends'. Surely that is what the trade in marine fish is all about? Perhaps use of the word merely emphasises how strongly we feel that if we do utilise wildlife simply for our own ends, then we must be absolutely certain that we do it properly.

We would like to echo the hopes of *The Aquarist and Pondkeeper* that we can all work together to establish guidelines and regulations for the marine aquarium trade and so ensure better standards.

Dr. Elizabeth Wood

Education necessary at source

Having read with interest the unbiased comments on the

report by Dr. Wood in the March issue of *The Aquarist and Pondkeeper*, it would be gratifying to know that this report is being given the same publicity in the countries where the basic problems start.

Surely, every caring and responsible marine aquarist in this country would welcome legislation banning the collection of marine fish and invertebrates that are known to be, at present, impossible to keep alive in captivity.

It cannot be denied that many retail outlets in this country leave much to be desired with their treatment and (mis)handling of newly-imported specimens. It has, however, become patently obvious that all the diligent handling and essential quarantining facilities cannot compensate for the stress that has undoubtedly already been induced by the, sometimes, inept methods of capture and subsequent inadequate care prior to export.

Sincerely,

Philip Hayden
(for Bath Aquatic Supplies)

The broader issues

During the first few weeks after the publication of Dr. Elizabeth Wood's report I was horrified to see how the media had interpreted its comments, resulting in, at best, alarmist and sensation-seeking headlines, features and articles. Sadly, I shall for evermore view any such material with a great degree of scepticism. I was, however, delighted at the treatment given to the report by *A & P*. It is refreshing to see *A & P* opening the lines for discussion in a balanced and responsible way, bringing in all the parties concerned.

For those of us who make our livelihood from coral reef fishes the term exploitation causes great concern. However, in reality any utilisation of a natural resource is exploitation. The real issues are how to create the right practices within this exploitation that first take due consider-

ation of the animals and the environment in which they live. Secondly, we require an understanding of the needs of those who catch and collect from the ocean, especially in the Third World, where daily needs are measured along totally different parameters from those of us in the West. For the average fisherman in Sri Lanka, Kenya or the Philippines he understands little about conservation. All he knows is that the sea has provided his needs and his father's before him. Like all fishermen worldwide, it is seen as their God-given right to exploit the sea. It is only in very recent times that there has been an awareness of the immense pressure on coastal resources. Fisheries, whether for food or the aquarium, are just one of the many pressures that bear on this environment. I can only give a judgment based on personal observation over literally dozens of trips to worldwide sources of supply for our industry over the last 16 years. I am firmly of the view that the pressure our hobby and industry put upon coral reefs on a global basis is, by far and away, the smallest of pressures upon it.

It is too easy to preach piety to the underdeveloped nations when we ourselves in Britain do not have a fully effective integrated fisheries and conservation programme. In reality, many of the nations we preach to have a far more effective marine environmental policy than we do, incorporating carefully controlled marine parks and active population monitoring.

From the beginning of Dr. Wood's project I felt that an open door policy was the most constructive thing we could do as a company. This led to a high degree of mutual trust and respect. As a conservationist, Dr. Wood had natural prejudices against the industry but I found her open-minded enough to listen to my views that our business was an acceptable utilisation of a fisheries resource. By and large, I am still pleased

to have participated in her project. The content of the report gives a reasonably true picture of the industry at the supply and distribution levels. I cannot say I agree with all she has written; in particular some statistical conclusions seem a little alarmist. Those who deal in fishes, good, bad and indifferent, tend to be unfairly lumped together.

1. IMPORTER LEVEL

It has long since been overdue for the trade to have a definitive policy towards importation and handling. I have seen little or no interest from the Ministry of Agriculture Fisheries and Food who, in theory, are the administrative body. The Department of the Environment has a responsibility to police CITES listed animals. As from last year many hard corals and all *Tridacna* species (Clams) have been put on CITES Appendix II, which for all intents and purposes, now makes the importation of these animals impossible. Sadly the blanket coverage of so many items makes a mockery of CITES, as (frankly) most of the listed species can in no way be seen to be endangered. For example, whereas there may be adequate grounds for protecting the Giant Clam (*Tridacna maxima*) in Australia due to Taiwanese poachers, I see no justification for including all the other *Tridacna* species from other parts of the world where they are abundant. My own personal experience of the new regulations so far, is that the responsible importers have had no choice but to cease importing such items. Meanwhile, the irresponsible importers have increased their business on these listed items.

I genuinely believe that control should come from within the industry itself. Perhaps O.F.I. should take a more positive role in creating new standards we should all work to, on a worldwide basis, rather than view this as a purely U.K. issue.

2. SUPPLIER LEVEL

As I have already pointed out, trying to change people's work practices in the Third World is difficult, but it is possible, as I have proven on several occasions in the past. Predominantly, it is a

process of education, showing the collector that by using environmentally sensible techniques he can secure a long-term future for himself. Much has been written about the sodium cyanide abuse in the Philippines. Regrettably, a majority of these so-called authorities have little or no first-hand experience of the facts. Naturally, I do not condone the use of cyanide, but it has become fashionable to blame its use on almost all fish losses from Asia. Back in the mid 70's, I made a positive decision to try and limit our purchases from the Philippines. Since that time, we have been very actively stimulating new sources of supply. We have managed to guarantee that all fish collected at these sources are all hand-caught. But the story is not that simple and does not stop there. Indeed, there are many species of fishes that can only come into our market from the Philippines, directly or indirectly. About a year ago I sent one of our people and his wife to the Philippines to see if anything could be done on a constructive basis. The first job was to build a modern fish system to hold and handle the fish. This proved a major point to us—a majority of the quality problems linked to Philippines fish were really down to the quality of handling and processing, as losses dropped dramatically when the improved disciplines were applied. Hence the process of education has started.

I believe that via the trade organisations like O.F.I., an international policy should be put together. There should be liaison between Government bodies such as Fisheries Departments and the international trade bodies. Here in the U.K., we have the excellent Tropical Marine Research Unit based at the University of York. They have years of experience in coastal management within the tropical environment; an internationally respected scientific organisation capable of advising not only on conservation, but being able to determine sustainable yields, and the impact of long-term collecting on the reef.

Dr. Elizabeth Wood's report opens up new lines of discussion for us all.

Richard Sankey
(Tropical Marine Centre)

THE AQUARISTS' BADGE



Re-introduced in response to numerous requests this attractive metal badge, which has a brooch type fitting, depicts an angelfish and a goldfish in silver on a blue background with a red surround bearing the words *Aqua cunae vitae ager nobis* ("Water is the Cradle of Life and the field of all our Endeavours").

The actual size of the badge is shown above and can be obtained from:

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Books

An Entertaining view of fish and their fascinating ways

Fish and their Behaviour
Gunther K. H. Zupanc
Tetra Verlag, £8.50

Some 10 years ago, I received a stencil-duplicated copy of a remarkable study on the behaviour of Convict Cichlids from a German schoolboy, one Gunther Zupanc. From such an auspicious start, that schoolboy went through university and postgraduate research, maintaining his interest in fish behaviour. Now, for the first time, the English reader has the opportunity to take advantage of the unique style of writing by Gunther, the appearance of the English edition of 'Fische und ihr Verhalten'—'Fish and their Behaviour'.

Published by Tetra, £8.50 will buy you 180 colourful pages of fascinating insights

into a great many aspects of the behaviour of fishes. It is certainly worth every penny. Often entertainingly anecdotal, the chapters are sometimes broad-ranging, considering for instance the whole spectrum of adaptations to extreme environments, and sometimes confined to discussions on one group of fish, such as the Drums.

This is the first time I have read right through an aquarium book from cover to cover because it was interesting, and I expect all who buy it will do the same. How can you resist such section headings as 'Submarines that spawn in the summer', the account of the problems the US Navy had with submarine detecting hydrophones that were picking up the spawning noises of Grayling.

Other chapters include sections on 'Swordtail social hierarchies', shoaling in fish, and a study of fish behaviour in relation to water chemistry.

I particularly enjoyed the chapter about Hans Fricke and his Clown Fish studies, again largely anecdotal, with almost as many details of the man as the fish.

As cichlids are favourite behavioural study subjects, they feature quite heavily in the book. There are summaries of most of the important researches into



this group of fish—including details of the mating system of Red Devils, the growling of Jewel Cichlids, instincts in Kribbs, and so on.

The book concludes with a chapter entitled 'Fishkeepers as Researchers'. This gives guidelines on things to look out for in your own fish tanks, experiments all aquarists could perform, using models, or by adapting an ordinary tape recorder.

Finally, a Glossary and suggested further reading will help those who wish to pursue the subject further. I suspect that, after reading this book the number of aquarists who will look at their fish in a new light will be many. This is a book that I thoroughly recommend—perhaps it ought to be required reading; it will certainly be enjoyed by all.

Ian C. Sellick



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Definitive look at fish genetics

Evolutionary Genetics of Fishes
Bruce J. Turner (Ed)
Plenum Press, \$85 (\$102 outside US & Canada)
ISBN 0-306-41520-8

This is a substantial book with a substantial price for the individual purchaser. However, this should not deter either the informed or scientifically trained aquarist from obtaining a copy or, at least, recommending his/her local library to do so.

'Evolutionary Genetics of Fishes' is part of a major series entitled 'Monographs in Evolutionary Biology' and, as such, is aimed fairly and squarely at ichthyologists and others with a scientific, zoological background.

It is written, as one would expect, in methodical, academic style and is comprehensive, up-to-date, and extremely useful as a source of further references on this complex but fascinating subject.

There are 12 chapters in all, each written by one or more leading authorities in the field. It is, therefore, difficult (if not impossible) to envisage a better book than this to recommend to anyone

interested in, and capable of, coming to grips with evolutionary genetics.

'Evolutionary Genetics of Fishes' is not an 'easy' book for the non-scientist—it is not meant to be. However, it is a book that we should all be aware of and use when we want to know more about the genetic mechanisms that make fish the fantastic creatures they are.

John A. Dawes

Step-by-step guide

You and Your Aquarium
Dick Mills
Dorling Kindersley, £9.95
ISBN 0-86318-086-8

When an author takes on the task of producing a book covering coldwater, freshwater tropical, tropical marine and coldwater marine species, (s)he faces a very difficult challenge indeed. To accomplish the job competently, informatively and interestingly, that author must be good—very good. Dick Mills is just such an author.

His latest offering has something for everybody, the only problem being that, with such a wide-ranging brief, some of the information is necessarily less comprehensive than it could have otherwise been. Nevertheless, the basics of setting up, stocking and maintenance have been

covered in such a way that all major pitfalls can be avoided simply by following the clear, step-by-step, illustrated instructions provided.

I was particularly pleased to see a section given over to coldwater (native) marines, an important subject not normally covered in other books. I was also pleased to find sections on fish anatomy, physiology, breeding, photography, showing, a glossary and appendices.

I was, however, disappointed at the overall drabness of some of the artwork (compared to the excellent full-colour photographs). The quality of the drawings themselves is good, but two-tone illustrations are far from ideal when they depict intrinsically colourful, interesting subjects such as tropical streams and swamps.

There are also one or two illustrations that leave something to be desired in terms of accuracy, such as the *Danio malabaricus* on page 15 which looks remarkably like a *Brachydanio rerio* and the 'flying' Hatchetfish on page 14—but, is there a book completely free of such slip-ups?

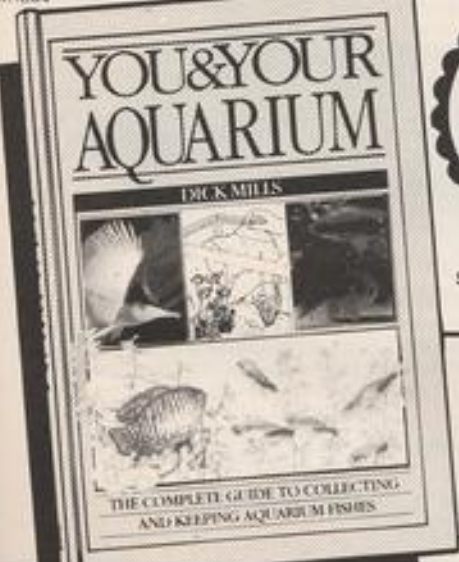
Despite these minor quibbles, the overall impression that I was left with was that 'You and Your Aquarium' is worth every penny. It is a book well up to the high standards we have come to expect from Dick Mills. I, therefore, warmly recommend it as a most worthwhile publication.

John A. Dawes

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Coldwater jottings



Stephen J. Smith

Clear water at low cost

A variety of different methods are used by coldwater fishkeepers to ensure that the water in their aquariums or ponds is crystal clear.

Healthy water makes for healthy fish, and there really is no such thing as the 'best' method: whichever works best for you is the optimum solution.

Regular partial water changes using siphon and bucket is about as far as many of us go to supplement the use, if any, of the traditional methods of filtration. At the other end of the scale, seasonal enthusiasts run fish-house and pond establishments with, seemingly, sophisticated filtration methods and tanks 'plumbed in' permanently.

Many aquarists even plumb mains water into each tank or pond to provide a constant trickle of fresh water running through their system.

A most efficient—and ingeniously simple—method of filtration was demonstrated to me by northern goldfish breeder Jack Larter. The system is contained within the aquarium and, thus, can be used by all fishkeepers with one tank or 100.

To install the filter a vertical baffle is positioned approximately three inches from one end of the tank. Silicone aquarium sealant is used around the sides and lower edge of the baffle, while the top should extend above water level.

If glass is used, the bottom corners should be cut diagonally to form an equilateral triangle and pieces of drilled perspex siliconed into the triangles to form the inlet and outlet parts of the filter.

The filter is divided into two by a second baffle plate positioned approxi-

mately two-thirds across the end and filter medium used to fill the bigger chamber. Hair curlers or short lengths of plastic drainage pipe are used to a depth above the drilled outlet port and thick sheets of filter foam fitted singly to just below the top of the chamber.

Through-flow is provided by an uplift tube constructed from two lengths of plastic piping joined using an elbow to form an inverted 'L'-shape.

The elbow is drilled to insert a standard airline siliconed into place so that the airstone is positioned near the lower end of the uplift.

The uplift assembly is held in place on the dividing baffle using heater clips so that the top of the uplift is above the filter medium.

When air is pumped through the airstone, water is drawn into the first chamber and transported up the pipe and out onto the medium. The first chamber acts as a settlement trap for large particles which can be siphoned off. Also, the top layers of filter foam can be rinsed periodically.

Once the system has become established, bacteria will thrive in the well-aerated water provided by the uplift. The result: crystal-clear water filtered chemically and biologically and with minimal installation and running costs.

A fish by any other name

During my visits to aquatic retailers and hobbyists around the country, I am continually amazed by the names used to describe some of the Fancy Goldfish available.

There would appear to be a great deal of confusion—so easily solved by consulting reputable publications or authorities within the hobby. By far the most infuriating for me is the description of my favourite goldfish, the Moor, as a 'Black Moor'.

By definition, a Moor is black! Or do they really exist in other colours too?

Similarly, the Redcap is often termed 'Redcap Oranda' when it is, itself, an

Oranda type. I have even heard of a 'hooded' Lionhead—need I say more!

Plants in the aquarium

Although I have, in previous 'Coldwater Jottings', extolled the virtues of keeping coldwater fish in completely bare tanks for ease of maintenance, I must confess to having at last succumbed to the attraction of a planted show tank in my living room.

All fish had previously been designated 'out of bounds' by my better half, but I was delighted when she took to a corner aquarium set-up in a local aquatic centre.

The aquarium is complemented by troughs for houseplants behind the two long sides. When established, the combination provides an attractive 'mini-pond' feature which has won favourable comment from almost every visitor!

Filtration in this case is an effective combination of an air-powered under-gravel filter and a small power filter.

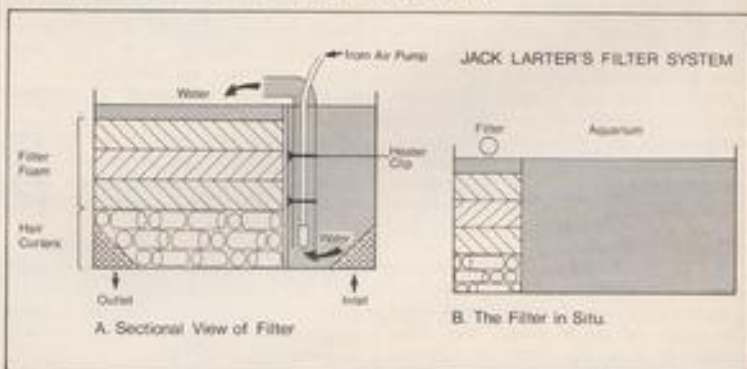
Plants are a pleasant mixture of *Myriophyllum*, twisted and straight *Vallisneria* and *Cabomba*. However, within just a couple of months, the fish have stripped the *Cabomba* and *Myriophyllum* and destroyed all but the roots of the *Vallis*!

Long live Kermit

Frogspawn in ponds can be an ideal supplementary food for coldwater fish, but do ensure that a good quantity is put by to develop as nature intended.

I always ensure that most of the frogspawn in my ponds is transported to some of the numerous natural ponds in the neighbouring countryside. Thus, the frog population is allowed to increase naturally without hatching in my garden.

In addition, mature frogs tend to return to their original hatching pond to spawn—which could be devastating to my fish stocks! However, while the frog may not be all too welcome in my establishment, it certainly commands my utmost respect for its rightful place among natural aquatic life.



Company profile

Britain's Aquatic Superstore

It's not just the sheer size of the building that makes Britain's Aquatic Superstore impressive. Virtually anywhere you look, spectacular statistics jump out and demand your attention.

For example, the coldwater section alone holds 75,000 gallons! Tropicals account for a further 45,000 gallons, while marines take up a mere(!) 14,000.

Servicing such a set-up, obviously, requires a considerable amount of plumbing—7 miles to be exact. "And I can still remember every single inch vividly," remarked John Gizzi, who, with his brother Dave, directs the whole complex operation.

The large collection of fish and invertebrates is displayed in nine 'blocks' of tanks and 22 ponds. The range of species is, as one would expect, very extensive. It couldn't really be any other way when there are, in addition to the ponds, 120 tanks for coldwater species, 400 for freshwater tropicals, 112 for tropical marine fish and 33 for marine invertebrates.

Each block consists of tanks ranging in size from 48 in. x 18 in. x 18 in. (some of them partitioned) along each length to 96 in. x 18 in. x 18 in. in each end section. This allows for flexibility and adaptability regarding what species can be stocked, as well as for the establishment of specialised sections. Consequently, one section houses Rift Lake Cichlids while others accommodate their South American counterparts, Livebearers, 'Community' species, and so on.

This arrangement doesn't only make things more convenient for customers—it also makes management considerably easier and allows for the provision of differing water conditions to suit the species concerned, i.e. alkaline water in the Rift Lake section, slightly acid water in the South American one, etc.

Next to this (the tropical freshwater and marine) department, is a long counter along which are displayed potted and loose aquatic plants and livefoods. At the end of the counter is the cash register for this part of the store which overlooks the dry goods, 'garden', Woodcraft and coldwater departments.

Dry goods are sold basically on a supermarket, self-service basis with payment being made at one of several check-outs. The range of goods (which was comprehensive from the start) is regularly widened and now embraces not just



Part of the large dry goods section

aquatics but also general pet requirements.

This benefits retail and trade customers alike, both being able to buy all their requirements, be they for individual pets or a shop, simply by walking down the aisles and picking out what they need.

Running such a large and diversified operation demands meticulous organisation since things could well fall apart if an impressive 'front' cannot be backed up with a sound management team and a carefully planned and run water quality control regime.

On the management side, Dave and John Gizzi have made great strides in the eleven months that their Superstore has been open. Managing the fish, plant and invertebrate part of the business are Adrian Moffatt (Fish Manager) and Steven Pritchard (Marine Specialist) under John's overall supervision. On the dry goods side, there is Christine Roper (Dry Goods Manageress) and Glen Marshall (Woodcraft Manager) with Dave overseeing activities. In addition, there is quite a large contingent of ancillary staff.

No matter how large and impressive an enterprise may be, in the end it will stand or fall on the quality of its stocks and, most importantly, on the advice that customers can get.

As far as the stocks are concerned, huge, sophisticated filtration systems incorporating mechanical, biological and ultra-violet devices, backed up by a large quarantine section, go a long way towards ensuring the well-being of the fish and invertebrates.

On the advice front, Adrian and Steven often spend whole days (especially during weekends) talking to customers, leaving the actual selling, at such times, to other members of staff. According to John and Dave Gizzi, there is no substitute for good, sound, solid advice even if the customer ends up buying something cheaper than (s)he intended in the first place.

An interesting side-shoot of this approach is represented by the special arrangements that are provided for societies if they visit as a group (following prior booking). If forewarning is given, then a member of staff can be made available and discounts arranged for meals taken in the store's own cafeteria as well as for goods bought.

Britain's Aquatic Superstore incorporates three separate companies: 'Dave's Aquarium' responsible for all the live-stock, 'D.A. Woodcraft' which manufactures cabinets, stands and other aquatic furniture, and 'Red Sea Aquariums' responsible for manufacturing all-glass tanks including those that come with the Woodcraft stands.

The company also runs regular deliveries all over the country to its factor, wholesale and retail clients.

For further details, contact Dave or John Gizzi, Britain's Aquatic Superstore, 225 Fold's Road, Bolton. Tel: (Bolton) 34343. Opening times:—Mon., Tues., Wed., Fri., Sat., 10.00 am-6.00 pm Thurs., 1.00 pm-9.00 pm. Sun., 10.00 am-5.00 pm. Closed on Christmas Day, Boxing Day and New Year's Day. Open on all Bank Holidays.

CICHLID SUPPLEMENT

SIX OF THE BEST CICHLIDS

Ian Sellick faces the difficult challenge of selecting his six favourite Cichlids and comes up with a varied and interesting choice

What an emotive phrase, with its overtones of corporal punishment, a good caning; six of the best! Well, there are still those who believe that this might adequately sum up the behaviour of many cichlids. A myth that ought to be dispelled. You know, there is a reason for everything in this world. If cichlids seem aggressive, it isn't because they were born to hate plants, or hate all other life forms, it is because they need to survive too, need to hold a territory, need to breed in privacy, need to rear their young without the attentions of other fish.

I must be one of those few curious aquarists who started at the deep end. My first tank housed a pair of Brown Acaras, and I'd been keeping fish for nearly a year before I knew what a Guppy was. I can always recall the disgust in the plump, balding shopkeeper's face in the pet shop in the Queensway, Hemel Hempstead, when I asked what those rather pretty little fish were (having been a customer for the intervening 11 months for cichlid accessories): "They're Guppies" he replied in an amazingly nice way, considering the circumstances.

Ideal Cichlid tank

The genesis of Sellick fishkeeping was really the angle-iron display tank at Primary School, the responsibility of Mr. Bell, I recall. On graduating to Secondary, I took with me a redundant Primary School aquarium, glass broken, and lovingly mended it. As a reward, I was bought a magnificent 42 in. x 15 in. x 15 in. for my next birthday, an ideal cichlid tank. I suppose I was really lured into cichlids by a fellow classmate from Rutherford House, Dave Wainwright, who had a prized collection of exotics, including a superb Oscar. My formative years in fishkeeping thus being moulded, I have stuck with Cichlids ever since.

It wasn't long, in fact, as soon as I was legally old enough to work part-time, before I was offered a job by Roy and Gwen Skipper, of Hendon Aquarist Society and Discus breeding fame, this compounding the cichlid orientated start to my fishkeeping career by an indoctrination into the world of the Discus. Apart from Discus, the House of Fishes had a constant throughput of other exciting species from all over the world, many of which soon arrived in my first fish house. A fish house largely paid for, incidentally, by breeding some of the first Malawi Cichlids to come into the country. My exposure to the unusual was increased by the occasional trip to the continent, particularly Belgium and Holland, but also to Germany and, particularly, to meet Dr. Terver of the Nancy Aquarium in France in its relatively early days. They say that what you are is conditioned by your upbringing: it should be no surprise that all this, fostered by tolerant parents (although I had to pay for just about everything I got, fish-wise, and thus learned the value of hard work), has resulted in a life-long enthusiasm for fish, and cichlids in particular and, currently, Chairmanship of the British Cichlid Association!

For my six fish, I must refer to the formative stages in my fishkeeping career and, particularly, to the highlights of it. My first choice is then the Brown Acara, for long known as *Aequidens portalegrensis*, but now regarded as one of the few true *Cichlasoma* species. One of a dozen similar brown species, I commend this gentle giant to anyone. Not gaudily coloured, but with an attractive pattern made up of black-edged scales, the Brown Acara is a simple, easy to breed species. Getting to 8 inches (males) in some cases, spawns of 2,000 plus can be achieved. Being the first cichlid I bred, I have a certain affection for the species, and indeed used it during a research project at Bristol University, when we reared

thousands of them to study cichlid growth rates under different experimental regimes of temperature and diet. An incidental finding, reported at the time, was that under conditions of low food, fry will feed from the sides of their parents, as do the next subject I am going to choose, Discus.

I have already mentioned the reason for my choice of Discus among my six of the best. Beautiful, gentle fish, yet still cichlids, and among the most intriguing from the Americas. Volumes have been written, so I need not pontificate here, but the pinnacle of success for most freshwater aquarists is still to breed and rear this species. Care with water conditions are essential, I would agree, but I do rather subscribe to the view that too many people have trouble with Discus because they are over-fussy and mess around with them too much. Shouldn't we in fact give the same degree of care to all our fish as we patiently give to Discus? Treat them as normal fish and do not get too paranoid and you will have success. Being surrounded by beautiful Discus in the early days of the House of Fishes gave me a great opportunity to study and be involved in the breeding of them, something I hope all will have a chance to enjoy. Perhaps the accompanying photo will suitably whet the appetite!

The Oscar, *Astronotus ocellatus* is another lovable beast. One of the giant cichlids, it is not, however, in the same league as the Central American piscivorous predators. As with most people who get trapped, I suppose I too was taken by the antics of the black marbled juveniles swimming up and down the dealer's tank following you and, it would seem, saying "feed me, feed me, take me home". So you do and you get hooked. Well, at least, I already had cichlids before I kept Oscars, but so many get into cichlids in this way, unfortunately, often still at the expense of a tank of community fish.

CICHLID SUPPLEMENT

As Oscars do, they grew space, and I obtained a few more, eventually ending up with a selection of adults that were successfully spawned and the young, or at least a proportion of them, reared. In my early days, no fish collection was complete without the obligatory specimen Oscar; this is still the case, but, perhaps, to a lesser extent with the range of other potential 'pet' fish there are around the hobby today. It was rare then to have enough adults to breed them. This is

still the case now, a great pity. A large tank with a number of Oscars is far better than a solitary specimen.

I must include Heinz in my collection. Another House of Fishes variety. He sat in a tank near the counter where it was our wont to eat, at lunchtimes, the pie and beans that seemed to be our staple diet. Heinz would swim up and down his tank, and one day I dropped a baked bean in, tomato sauce removed, naturally. Lovely, down it went and 'can I have

some more'. Not too many of course, but Heinz used to get occasional beans to keep him in trim. Hence, of course, the name. A superb specimen, Heinz was a credit to his species, *Simochromis diagramma*, more normally found grazing algae or eating invertebrate larvae in Lake Tanganyika.

Having spent six years at University studying zoology and cichlids in particular, and 20 years in all keeping and breeding fish, I have kept a very large



Right, the gentle Brown Acara, formerly known as *Aequidens* but now regarded as *Cichlasoma*.

Above, everybody's dream—a Discus with its shoal of young

Right above, *Astronotus ocellatus*, the Oscar, soon becomes a real 'pet' if given the care it deserves

Far right, above, Heinz, a *Simochromis diagramma* with a liking for baked beans!

Far right, '*Cichlasoma*' *maculicauda*—the first Cichlid ever seen in the wild by the author

CICHLID SUPPLEMENT

proportion of the available species at one time or another, so to choose six is difficult. My final two, though, are reminders of a very special time in my life, when I was able to visit Central America and observe and collect some unique cichlids in the wild, in particular in the wilds of Darién, Panama.

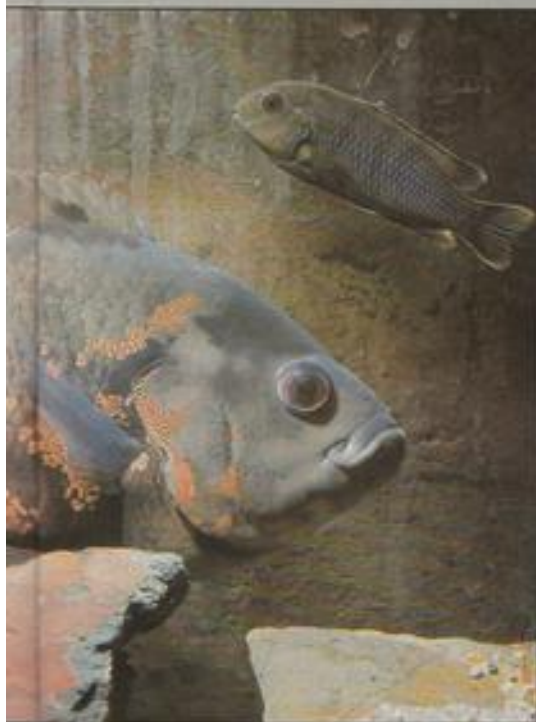
From that trip, I include '*Cichlasoma*' *maculicauda*, now commonly available as an aquarium fish. The Black Belt Cichlid was the first tropical fish I saw in the wild,

on Christmas Day of all days, in Lago Gatun, near Panama City. It is a moving, experience to suddenly have it brought home to you that the fish you have been keeping for years are real, and do have an existence outside the confines of the aquarium. I have written much about this species and so refer readers to the August 1983 *Aquarist and Pondkeeper*.

Finally, to conclude my personal six of the best; '*Cichlasoma*' *panamense*. Without a doubt, although having been

responsible, with Teresa Townshend, for introducing them to the European hobby I am a little biased, the most colourful, delightful small cichlid for the Central American enthusiast. Easy to spawn, with pattern and colour changes on breeding to delight all, I leave my six of the best for your consideration, and hope you will get as much enjoyment from these species as I have over the years. (See article by Richard Crow, 'Breeding Central American Cichlids' for photographs of *C. panamense*).

Photographs by the author



MBUNA

MOUTHBROODERS FROM LAKE MALAWI

Firmly established within the hobby, these mouthbrooding Cichlids still continue to fascinate. Mary Bailey, Technical Editor of the British Cichlid Association, sorts out the do's and don'ts of successful Mbuna care

Mbuna (pronounced 'oom-boona') is the native name for a group of 10 genera of rock-dwelling, mouthbrooding, cichlids, mainly brightly-coloured, endemic to Lake Malawi—*Pseudotropheus*, *Melanochromis*, *Petrotilapia*, *Labidochromis*, *Labeotropheus*, *Cynotilapia*, *Idotropheus*, *Cyathochromis*, *Gephyrochromis*, and *Genyochromis*—not all of which are available to the aquarist. The number of species is not known—these fishes inhabit areas of rocky shoreline separated by stretches of sandy bottom, which, because the fishes rarely stray far from the rocks, serve as effective barriers to migration from one area to the next. It is now thought that some look-alike populations from different areas may be distinct species. In addition, some areas of the lake remain unexplored.

Because the water is comparatively shallow at the lake edges, the rocks are covered in a dense algal growth known as 'Aufwuchs', which is home to numerous small organisms. The Mbuna have evolved a variety of feeding mechanisms to exploit the ecological niches offered by this habitat. For example, *Labeotropheus* has an underlung slit mouth for grazing, while *Labidochromis* has forceps-like dentition for picking organisms from the algae. Feeding is not restricted to the 'Aufwuchs'—*Genyochromis* steals scales and pieces of fin from other Mbuna, and *Pseudotropheus crabro* acts as a cleaner-fish, removing parasites from other fishes.

Some very aggressive species maintain 'algal gardens', areas where only they are allowed to feed—except that in times of shortage, groups of non-territorial females of various species descend on these gardens and pillage them by force of numbers!

These varied feeding mechanisms allow maximum benefit to be derived from the available food supply; but Mbuna are also opportunistic feeders, able and willing to eat anything suitable when available. Wild-caught fish have no doubts about earthworms!

Various factors are important when keeping these fishes in captivity: water chemistry and quality; tank decor; diet; and some knowledge of cichlid psychology!

It is useless to follow normal fish-keeping rules—initial attempts to keep Mbuna, using normal stocking densities, led to losses through murder. We now know that aggression can be reduced in mouthbrooders by crowding them, so that no individual can occupy much territory, and the loser of any squabble can hide in the crowd. Unlike substrate spawners, mouthbrooders do not need to hold territory to protect their eggs/fry, and males can generally hold a small territory for use as a spawning site, without taking over the entire tank. Recommended stocking density is 4-5, 4 in. fishes per square foot of tank bottom.

Even with territoriality thus reduced, 36 in. is the minimum tank length with any chance of success, and 48 in. or more is far better. The other dimensions are less important, within reason.

Water conditions are very important. Their natural waters are very clean and highly oxygenated, moderately hard, and alkaline, and, with the exception of hardness, these conditions must be simulated. Optimum hardness is 7-10 dGH, but the fish will thrive and breed in anything from 2-20 dGH. The other factors are vital, however. pH must remain alkaline, ideally above 7.5; acidity leads to illness and eventual death.

Because fish wastes have an acidifying

effect, it is desirable to buffer the pH with some lime-bearing material in the tank furnishings—some limestone in the rockwork, and/or crushed shell, coral sand, or dolomite chippings in the substrate.

Mbuna dislike concentrations of waste products (nitrites and nitrates). Because the tank is crowded, this potential problem should be avoided by regular weekly water changes of 25-30%. Biological filtration (ideally undergravel) is almost essential to ensure rapid conversion of toxic nitrite to relatively harmless nitrate. Whenever Mbuna seem off colour, water chemistry and quality should be checked before suspecting disease.

Some form of reasonably strong aeration is essential. Without it Mbuna gasp at the surface, with stress to the gills and possibly death. Aeration must be for 24 hours/day and the source reliable; it is a good idea to have spares available.

Temperature should be 78-81°F (25-26°C).

Tank decor should be designed to provide as large a number of hiding-places as possible. Rock is probably the most aesthetically pleasing material, but drainpipes, housebricks, flowerpots, etc., are acceptable. Well-aged or varnished bogwood may be used as well. The quantity of rockwork should be 'ridiculous' by normal standards—50% of tank volume is not too much, and open areas of substrate are unnecessary.

Because any fish that is persecuted tends to gravitate to the top rear corners, where it presents a highly visible target for further attacks, it is sensible to provide some upper level retreats which, as well as providing refuge, break up the visibility along the length of the tank—the 'out of sight, out of mind' principle applies here. This can be achieved by slates stood vertically, bogwood perched on top of the rocks (safer than rock sky-scrappers!), or by floating refuges, eg. cork bark, plastic pipe, or even floating plants such as Indian Fern.

The rockwork should be well-founded, with the base blocks on the bottom with no gravel under them. Think big—a large capstone is less likely to be dislodged, and looks impressive. The back and ends can be protected by lining with slates, at a slight angle to provide caves behind, and the rockwork built so that, if it does go, it goes onto the slates and not through the front glass! Rockwork may look sterile to start with, but once algae get a foothold, the effect is very pleasing.

Plants can be grown in Mbuna tanks, but they must be well-rooted before fish are introduced to avoid accidental uprooting by boisterous Mbuna. It is pointless to introduce plants after fish—they will be treated as intruders and dealt with accordingly! The addition of a large



plastic plant will provide entertainment for fish and aquarist!

The final important maintenance factor is diet. Mbuna have large appetites and require 'bulky' foods, (eg) beef heart, cooked chicken, earthworms, etc. Because of their natural diet it is sensible to add some vegetable matter — cooked peas, spinach, scalded lettuce. Some dried food, preferably a variety of pellets, will ensure vitamins and trace elements. Feeding on flake alone is likely to result in hollow-bellied fishes that won't breed. Under no circumstances should *Tubifex* be given—these worms do not occur in the clean waters of the natural habitat, and Mbuna have no resistance to *Tubifex*-carried diseases. Heavy losses may occur, particularly in young fish.

If attention is paid to the above factors it should be only a matter of time before spawning takes place. Mbuna are not seasonal breeders, but will breed all the year round if the food supply is adequate. When a female is ripe she will seek out a male (in the confines of the aquarium this translates as 'stops running away when challenged!'); spawning takes place with few preliminaries, usually on a flat stone in the open. The female lays a few eggs, turns round and picks them up, and then attempts to pick up the egg dummies of the male, thus receiving sperm to

fertilise the eggs. The pair then change positions, the male nudging the female's belly until more eggs are laid. This continues until, and often after, the eggs are all laid.

In the wild the female then retires to some quiet place to brood eggs/fry for 17-24 days. In the aquarium, however, she doesn't have this option, and is likely to be harassed and even killed by the male who wants to continue spawning. So, normal practice is to remove her to a small tank, with a flowerpot as cave, to brood in peace. She must be netted carefully, guided into the net with a hand rather than chased, and scooped out of the net in a bowl, so she is never out of water.

When the fry are released the female should be removed and reconditioned before return to the community, as she will be weak from her fast and will be treated as an intruder by her former tankmates.

Mbuna fry are quite large, and normally resemble the female. They can take small live foods, cod roe, and powdered flake, upon release. If they are well fed and water quality scrupulously maintained they will grow quickly.

Introducing fishes is a problem with Mbuna—the rockwork can be rearranged to upset residents, if practicable; or

Above: *Pseudotropheus zebra* was once thought to exist as numerous colour morphs. Today, some of the 'zebra' look-alikes are believed to belong to different species
Left: There seems to be an Mbuna for every niche—*Pseudotropheus crabro* is a cleaner-fish

Left, above: *Melanochromis auratus* (this is a female) is among the most difficult of the Mbuna to keep successfully in aquaria

several fishes can be 'saved up' and introduced together to spread the aggression. If bullying does occur it is best to remove the bully to 'gao', instead of stressing the weaker victim further by removing it.

Two common problems face the Mbuna-keeper—hybridisation and 'Bloat'. A ripe female who cannot find the correct male will make do with anyone willing—the remedy should be obvious! Occasionally a strong male will barge in; if hybrids do occur, for this or any reason, they should be destroyed.

'Bloat' is an illness in which the fish swells up and soon dies; it particularly affects East African mouthbrooders. Its causes appear to be environmental—poor water quality, too much common salt added, or a monotonous/indigestible diet, and these factors should be examined rather than suspecting infection.

Finally, a note on choice of species. It is a pity that *Melanochromis auratus* is so beautiful and so readily available, as it, and other members of that genus, are quite difficult. They don't like any fish of similar appearance in the tank, even though they leave vertically-banded species alone. This fish has convinced many beginners that Mbuna are murderous and best avoided! Another species to be shunned is *Pseudotropheus elongatus*, which hates everyone! Those apart, it's a matter of availability and personal preference; but just remember, Mbuna are very much individuals, and that gorgeous fish in a tank by itself is probably not there for its own health!

CICHLID SUPPLEMENT

BREEDING CENTRAL AMERICAN CICHLIDS

Our Supplement cover picture shows a fully-grown '*Cichlasoma*' *synspilum* guarding its young. Richard Crow, Editor of B.C.A. publications, explains how this and other Cichlid species can be bred in the aquarium

Of all the aquarium fishes, cichlids probably rank as some of the easiest egg-layers to spawn. The Convict ('*Cichlasoma nigrofasciatum*') has earned text-book notoriety for its reproductive prowess in the aquarium and, while there is no real reason why any of the other Central American '*Cichlasomas*' should be any more difficult to spawn, people still seem to have problems.

Firstly, an aquarium (the larger the better) should be set up using under-gravel filters. Above this there should be a gravel-tidy to stop the future occupants digging down to the filter plates, but this is optional; nitrite problems rarely occur even if they do dig down to the filter plates.

On top of the gravel-tidy place another inch or two of gravel then ample pieces of slate, rocks, flowerpots or bogwood to form caves and spawning sites. It is possible to get away with not using a sub-gravel filter and only use a power-filter but these do not give really effective biological filtration which is a benefit with large cichlids. By all means supplement the sub-gravel filter with power-filtration if you can.

Lighting levels

Lighting levels should be low, 40 watts of Gro-Lux is ample for a 60 gallon aquarium. A big mistake often made when trying to spawn neotropical cichlids is to use too much light; they are rather more timid than their reputation suggests.

Water constituents are relatively unimportant as most large neotropicals will spawn in hard and soft water alike, though one should avoid extremes of acidity and alkalinity. Temperature should be set at around 78°F and good

aeration provided.

Once the aquarium has matured for a couple of weeks it is time to obtain breeding stock.

There is something to suit all aquaria sizes from thirty inches upwards but it is important that you pick the right fish. As a good general rule, allow 3 to 4 gallons of aquarium space for each inch of fish you plan to breed. For example, if you plan on spawning '*Cichlasoma*' *synspilum* they will spawn at about six inches; that's twelve inches of fish, so you, therefore, need a 36 to 48 gallon aquarium. Provide more space and you will be rewarded, provide less and you will have

problems. (See supplement cover photograph of '*C.*' *synspilum* with fry).

Buy your breeding stock from a shop that stocks a number of cichlids not a pet shop that might only have one species and not many of those either. Better still, obtain them through the British Cichlid Association 'Trading post'; (Membership details of the British Cichlid Association: £9.00 per annum, or send large S.A.E. for Information Pack to Dave Monk, 33 Kirkmeadow, Bretton, Peterborough, Cambs.) that way you can speak to the person who actually bred them.

Buy young fish (one inch standard

A pair of '*Cichlasoma*' *panamense* spawning in typical Central American fashion. (Photo: Ian C. Sellick)



CICHLID SUPPLEMENT

length is not too small) and they will settle down to your tank conditions more easily. Buy at least half a dozen, more if you can afford it. Once two of them pair off you can return the rest to a dealer and, by that time, they should have grown enough for you to be able to recoup the cost or even show a small profit! Pick varied sized fishes as males are usually larger and to pick all the large ones might mean all males; it's difficult to breed with all males! Avoid the very smallest fish in the tank. Once home, release the fish into their tank after observing all standard aquarium procedures.

Feed your breeding stock three to four times a day (if possible) on a varied diet. Beef heart is a good staple food. Cut off all fat and place in a blender till it

becomes a purée, then mix in some flake and freeze it in plastic bags after 'rolling' them to half centimeter sheets. Freeze-dried *Tubi/ex*, pelleted food and other dried foods are all accepted as are most livefoods but avoid live *Tubi/ex*. Some vegetable matter is also a must for good digestion. Feed your fish tinned garden peas that have had the shells 'popped' off or tinned spinach. Even if they don't appear all that keen to eat vegetable matter it should be offered at least twice a week.

Perform 25% water changes each week, twice a week if the fish you've chosen are the larger sort or if your filtration system is not what it should be.

If all goes well, your fish should grow fast and take on adult coloration. With good luck, a pair will form. The first

signs are two fish together, pecking at rocks and snatching brief moments together, jaw-locking and tail-wagging to each other, pit digging, increased aggression, an intensification of body colour and, perhaps, a change of eye colour. Spawning tubes start to emerge a little from just fore of the anal fin. Other fish are best removed at this point for their own safety. Bump the temperature up 3 or 4°F and the pair should now get down to breeding.

They start by cleaning the chosen spawning site which may be a piece of slate, rock, flowerpot, or they may dig down to the gravel-tidy and use that. Spawning tubes emerge fully and the pair then circle the site, lightly running their tubes over it with an intermittent break to peck the rock absolutely clean. Eggs soon start to arrive in threes and fours, then by tens and twenties. The male goes over each little 'string of pearls' and fertilizes them. After 30 minutes to a couple of hours they are all laid and either the female on her own or both fish in turn (depending on the species) fan and mouth them.

Nursery pit

Again, depending on the species, they hatch in 38 to 80 hours and are taken by the parents to a 'nursery pit' which they will have dug during egg care. The fry do not need feeding for another 3 to 7 days as they live off their yolk sac for this time. Once they start swimming they should be fed newly-hatched *Artemia salina* (Brine Shrimp) if possible. Doremix or flake food crushed and sieved through a tea strainer will suffice instead of *Artemia*, but fry growth will not be as rapid. As the young grow, they can progress onto dusted food.

With spawnings of 300 being the bare minimum, young have to be culled drastically. Do this at a young age by netting out as many as you want to get rid of and give them as food to your other fish. This may seem cruel, but it is what would happen in nature; that is why they have so many young. Soon your young will be the size that your adults were when you bought them and you will have observed them full circle.

If problems are experienced with the parents eating the eggs, try placing another active fish behind a clear divider at one end of the tank. This gives the parents something to guard their eggs against and brings out their natural instinct. If all else fails, the eggs can be artificially hatched away from the parents by placing an airstone one inch or so away from them and adding 2 drops of methylene blue per gallon—successful, but nowhere near as satisfying as seeing a pair with a couple of hundred young swimming around them!

The same pair photographed several days later protecting their fry. (Photo: Ian C. Sellick)



DISCUS UPDATE

Confusion still exists concerning the varieties and upkeep of Discus. Eberhard Schulze teases out the problems and reveals his 'secret formula'

(Photographs by the author)

I often receive letters from would-be, as well as seasoned, Discus keepers and, surprisingly, I feel there still is a great deal of apprehension or doubt even regarding some of the accepted 'fundamentals'. The questions most frequently asked are: (1) colours, (2) water conditions and (3) food or feeding. It is my intention to deal basically with these 3 points in this up-date even though the last comprehensive article on Discus appeared in this magazine more than 10 years ago.

The Significance of Colour

It is a sad fact that the greatest numbers of letters state that so and so sold a Discus and guaranteed that it would be the most glorious-coloured specimen ever seen, whereas, after a while, this glorious-coloured specimen, in fact, shows very little real colour or wasn't like anything ever seen in any book. My comments are usually always the same: It is possible that the shopkeeper also was sold a fish without the glorious colours and believed what he was told, or there are, and always have been, those few who felt that the sale of such a fish would not be found out

since the hobbyist, hopefully, is not able to keep it alive long enough. It goes without saying that these establishments close down after a while. By talking to your fishkeeping friends and 'making the rounds' as many hobbyists do, it is easy for anyone to find honest retailers who just could not afford to sell anyone a Common Discus with a fantastic label.

We must, of course, realize when looking at these fish, that not every Discus shows the same colours as the one pictured 'in the book'. Every editor of any magazine or author of a book is interested in 'good' pictures, but, unfortunately, most of the fish available do not come up to these standards.

Any Discus keeper should be able to distinguish between any of the wild-caught specimens. These have been illustrated over and over again and their colour patterns are easily recognised. The 'True Discus', *Symphysodon discus* Heckel, 1840, with its wavy lines and three main bars, through the eye, through the centre and through the base of the tail fin, can never be anything else but a True Discus. The 'Green Discus', *Symphysodon aequifasciata* Pellegrin, 1903, will always show red spots. On a fine specimen these

spots will cover more than two thirds of the body; on an average specimen there will be fewer but, again, this fish could never be anything else but a 'Green Discus', because of the red spots. The 'Common' or 'Brown Discus', *Symphysodon aequifasciata axelradi* Schultz, 1960, has only markings on the gill covers and over the eyes.

The 'Blue Discus', *Symphysodon aequifasciata haraldi* Schultz, 1960, has the same markings as the 'Brown Discus' but they extend further into the body, both at the top and the bottom. The 'Royal Blue' is nothing more than a better marked 'Blue' where the markings cover also the centre part of the body. All these fish show colours, red or blue or both, either spots or stripes in their fins, but this does in no way change their pedigree. Wild-caught Discus are recognised and identified by the markings on their bodies. Occasionally, it becomes very difficult to distinguish between a good 'Brown Discus' where the markings go partly into the body or a bad 'Blue Discus' where the markings go not far enough into the body. In cases like that the fish should be judged by its other characteristics, regardless whether it is a 'Brown' or a 'Blue'.

CICHLID SUPPLEMENT

The so-called 'Hybrids', either American or German, can be put into 3 groups; (1) where Turquoise, Turquoise/Blue or Turquoise/Green is the predominant colour, (2) where Red (with Turquoise) is the predominant colour or (3) where the whole body is more or less of a single colour. The fish in (1) will either be marked with broken lines, dotted or pearly, or in a Royal Blue manner. These fish are 'Turquoise

Discus'. The fish in (2) will also either be marked with broken lines, dotted or pearly, or in a Royal Blue manner, but the overall effect will be redder than in (1). These fish are known as 'Turquoise X Red', or 'Red Turquoise'. The fish in (3) may have faint spots to indicate markings on a Turquoise, Turquoise/Blue or Turquoise/Green body and are known as 'Brilliant Turquoise'.

That there is very little difference in,



Wild-caught 'Blue' Discus



Turquoise X 'Royal Blue high fin'



First 'Turquoise/Red' ever imported into England by the Highgate Aquarist.



Group of 'Turquoise' youngsters

CICHLID SUPPLEMENT

say, a Wattley or Schmidt-Focke Turquoise Discus is due to the fact that most of the top breeders in the world have, over a very long time, not only shared knowledge but also fish and, as far as I am concerned, a Wattley Discus means nothing else but to indicate that it was originally bred by Mr. Jack Wattley. If we now were to find ourselves with a fish bred by Jo Brown from Schmidt-Focke stock I see no objection to call this fish a Schmidt-Focke Turquoise Discus, but not a Schmidt-Focke-bred Discus. I know of a breeder in Thailand who started many years ago with Schmidt-Focke Turquoise Discus and today produces many hundreds of perfectly marked and coloured fish equally as good as anything coming out of Germany. Although a Discus with a German label smacked to it will always be in demand, I feel that the breeding of these fish will more and more be done in Thailand and Malaysia where the labour costs, food costs and most other expenses are minimal. As long as they keep up the high standard and do not fall into the same trap as many of the Singapore breeders, our supply of Turquoise Discus will be assured for years to come, even though they might not come from the country so long associated with these superbly coloured fish.

The Importance of Water Quality

Water is the element in which all the fish live and its chemical composition is the main factor governing the health and well-being of all fish. Almost every fishkeeper knows that Discus 'need' soft, acid water. What most Discus keepers don't know is that very soft, acid water can, in fact, be very harmful for the well-being of these fish.

We know from all the reports published by scientists/hobbyists who have collected data in South America that the natural water of Discus is almost free from any dissolved minerals, with a hardness of perhaps a 1/2° of DH and a conductivity of often less than 50 uS. The pH values of these waters also vary between 5.0 to 7.4 depending on the time of year. This should show us that Discus are, like most other tropical aquarium fish, very adaptable.

We also know from the many articles published in the magazines, that breeders like Schmidt-Focke in Germany, maintain their fish in a water with a conductivity of around 150 uS; Herr Homan, also of Western Germany, keeps his charges somewhat higher, between 200 to 250 uS; breeders in Singapore tend to keep them always around 100 uS, but breeders in Malaysia seem to follow the Germans and keep them at approx. 150 to 250. What I found really very surprising was that one of the most successful breeders in Thailand kept all his breeding pairs in

water with a conductivity as low as 50 uS and as high as 500 uS; and these figures were checked by my friend Rachanok Srichaba who was able to confirm my measurements.

To create a suitable water for our chosen fish, many aquarists have wrongly believed that deionised water would be ideal. After all, it is soft and, often, also acid. However, there are probably many hundreds of different types of ion-exchange resins available, but only very few are suitable for keeping fish. It should be a matter of concern to anyone involved with fishkeeping to make sure that the water obtained through deionising is safe for fish in general, and Discus in particular.

It is well-known that, some years ago, a hobbyist lost several thousand pounds worth of Discus and breeding stock by refilling his old deioniser with the wrong

purification and avoid the drop of the pH values into the dangerous regions. As a rule of thumb, the softer the water, the more additives are required. In hard water the use of a water conditioner, apart from removing of the chlorine, would almost be superfluous, whereas in soft water the quantities ought to be doubled. In fact, I do not only use a more than generous dose of water conditioner like Duplagan, but also AquaCondit, and DisciAmin at the same time as well as Mikrosal to enrich the water with all the essential trace elements. Any non-believer can, obviously, experiment and will find that fish in water treated in this way will not only show better colours, eat better (because of the amino acids in DisciAmin) but also have less trouble with bacterial diseases, and, most important, the fish seem to become better breeders.

'Secret Formula' Revealed

There has, for a long time, been a rumour that I feed all my Discus with a 'special food' and that I was not willing to give my 'secret' recipe to anyone. I have never had such a secret recipe, but I have improved my standard feed over the years. What goes without saying is that I have not in the last 10 years or so ever fed Discus with live *Tubifex* worms. With all the foods available today, there is no need to feed this kind of food, which, more often than not, will result in the fishes' early death.

My prepared food consists of the following: 1 whole good size beef heart, (after cleaning off all the fat etc, 50% will have been wasted), cut into small pieces and put through a food processor. To this I add approx 1/2 of a tin of Tetra Ruby, plus 1 complete box of Aquabiofood U (vitamins and amino acids). To this I then add a quantity of the DisciAmin Powder, (a new colour enhancer which is completely safe—unlike certain hormones which were used in the past), and a small quantity of gelatine to hold it all together. The resulting mix is then divided into four equal lots. To one I add some finely chopped frozen spinach, to the second I add one packet of Black Mosquito Larvae (approx 100 gr) and to the third I add one packet of Bloodworms (approx 100 gr) and, finally, I leave the last quarter as it is. The portions are all frozen separately and cut into small chocolate-like pieces. When they are frozen properly, they then can be cut properly and all mixed together. When feeding, my Discus will get whatever comes to hand and they do not mind even getting the same fare twice. Apart from this, they will also be fed on a variety of frozen foods. Although they are not fed any livefood, they still grow into fine specimens.

It should be a matter of concern to anyone involved in fishkeeping to make sure that the water obtained through deionising is safe for fish in general, and Discus in particular

kind of resin even though they were labelled: Cation and Anion. The best combination of resins for fishkeeping, (and they have been used by hobbyists all over the world for more than 20 years), is a colour-indicating resin called S100 G1 as the Cation, and a weak base Anion resin called A303. A unit filled with such a combination of resin will give the serious Discus keeper many years (about 20, if the resins do not dry out or freeze) of perfect water.

If the water in an aquarium is too soft, or even if it is pure deionised water, this is generally detrimental. This water is dead water; it contains nothing; the oxygen level of such a water is almost nil and must be avoided. An average type of water to raise Discus ought to be anything between 6 to 10 dKH. Most fish will also breed at about 4 dKH. At 4 dKH there is enough carbonate in the water to buffer the pH and, with the aid of high oxygen levels, to maintain biological

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Marine

Success with invertebrates

I have a 36 in. x 12 in. x 15 in. marine aquarium stocked with one Maroon Clownfish approx. 2 in. and one shrimp approx. 2 in. (name unknown). Fish and shrimp very active and feeding well. I wish to keep invertebrates but so far have been unsuccessful. I purchased two coral heads from my local dealer, and in their tank they were well extended and full of movement, and when installed in my tank the heads remain stumped and lifeless. I would be grateful if you could explain the reason for this and give me a remedy. I also have a tubetorm and this seems to be doing alright. The aquarium is fitted with two undergravel filters. Temperature: approx. 75°-80°. S.G.: approx. 1.020 at 75°. pH: approx. 8.3. Nitrite: Nil. Lighting consists of three x 2 ft. white tubes on for approx. 12 hours per day. The tank is fitted with a plastic condensation tray but I do not think this will interfere with the light reaching the coral heads. Feeding is with a well-known invertebrate food as directed by instructions.

The reasons why marine invertebrates do not do well in a particular tank are many and varied but the most likely causes in descending order of likelihood are:

1. LIGHTING—in order to

succeed with members of the phylum Coelenterata from the Tropics, an enormous amount of light is an imperative condition. Not only is the amount of light falling on the tank important but the colour quality of the light is very important.

I suggest that you add at least two more fluorescent tubes to your hood, i.e. a 36 in. Gro-Lux and a 36 in. North-light. If 3-foot long tubes just will not fit into your hood then you will have to use 30 in. tubes. The only alternative to this battery of tubes would be to use a Wotan mercury vapour discharge spotlight: 'Wotan L-Flora' positioned centrally above the tank.

If you decide to stay with fluorescent tubes (which certainly give a more evenly distributed light) then you must keep careful records of their age and change them at regular intervals.

Almost all marine invertebrates require at least 12 hours of artificial light per day—and 14-16 hours would be

better. However, working on the minimum photoperiod of 12 hrs/day, you will readily perceive that in just less than 6 months you will have exhausted the tube's working life of 2,000 hours. Using the vastly preferable 16-hour daily photoperiod, the tubes will require replacement every four months.

Many invertebrates do not seem to be particularly light dependent and Featherduster worms and crustaceans such as crabs, shrimps, prawns, lobsters, etc., are examples of those creatures with relatively low lighting requirements for which your existing tubes, no matter what their age, are quite adequate.

2. VITAMINS—all coral-fishes and invertebrates (and especially coelenterates such as living corals and anemones) have a huge vitamin requirement which, unfortunately, is not met entirely by the vitamins present in flake-foods nor even those present in fresh-frozen irradiated sea-foods. It is vitally important that you add a balanced vit-

amin supplement, such as 'Seavita', directly to the seawater three or four times each week. You will be astonished how all the invertebrates and the coral-fishes will show immediate and easily detected benefits.

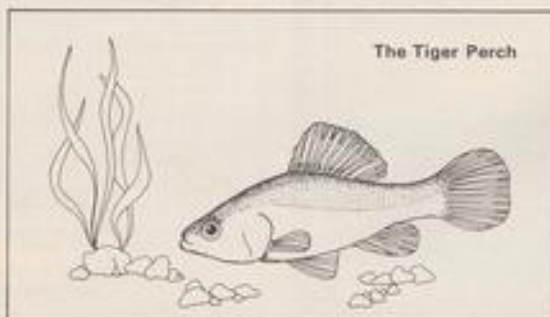
3. TRACE ELEMENTS—all coral-fishes and particularly invertebrates and algae take up from the seawater continual and substantial amounts of trace elements and concentrate them in their bodies. The regular weekly usage of a trace element booster is of paramount importance for long-term success in maintaining a marine aquarium.

Coldwater The Tiger Perch

Can you tell me anything about the Tiger Perch?

I have looked in several books and asked at Aquarist shops, but am unable to find out anything about it. How big does it grow and what is its diet?

The Tiger Perch, (*Aphrododermis sayana*) frequents streams and still waters of the southern states of the U.S.A. It reaches a length of five inches. It is bronze-green in colour with dark spots and markings. It has a large head with a protruding lower jaw, which has rows of small teeth. It is carnivorous and feeds on small fishes, worms and the larvae of



insects. It is a very aggressive fish and must not be kept with other fishes. It likes to take up territory under rock-work, and attacks anything venturing near it. It is not a popular tank fish for those reasons and few shops are likely to stock it. If you particularly wish to acquire one, you had better contact an importer of fishes from the U.S.A.

The fish can be kept in an unheated tank in a living room. A low wattage lamp in the hood will be useful should the temperature of the water drop below 65°F. The water must be kept in good condition and it may be necessary to change about two thirds for fresh twice a week.

Fancy goldfish . . .

I would like to breed and exhibit Fancy Goldfish. How long will it take to get a good strain of fishes fit to exhibit?

It is impossible to state how long it will take you to breed exhibition Fancy Goldfish. So much depends on

the type of fishes you wish to start your strain. It could take a few years or only a couple. This depends on the strain of fishes with which you make a start. If you can get a pair or two from a prize winning strain you will be half way there. Any fishes from such a strain are almost certain to throw at least a few very good youngsters. With luck you might even get a prize winner among them. Any fishes from a long standing strain of good fishes are sure to pass on the genes which should be of good quality. However, it is necessary for you to be able to sort out the youngsters at an early stage, so that you can concentrate on the good ones. Not that prize winners can be picked out at an early age. This is especially so when one is breeding any variety of double-tailed fishes. The start of a double-tail can be noticed when the fry are quite small. Such fishes will show that the end of the tail appears to be 'spade' shaped, whereas the single-tailed ones will be quite thin. However, it may be that the tail does not divide as required and

repeated sorting is necessary. Until one has bred Fancy Goldfish, it is not possible to realise how many variations can be found. With many strains one may be lucky to find a dozen almost perfect fishes from two or three spawnings. It is a great game of patience, but it is well worth the trouble when at least a few fishes appear which are worth exhibiting.

Of course, the sorting does not stop with the tail formation; the double-tailed types must also have double anal fins. And the shape of the dorsal fin can vary. Then there is the shape of the body to consider and eventually the colour. Altogether, a game of patience.

The male is 5 inches long and the female is 4 inches. The temperature in the 48 in. x 15 in. x 15 in. tank is 75°F and the water is alkaline. There are plenty of rocks, gravel and vegetation which is: Fontinalis gracilis, and a floating plant that has jagged leaves and multiplies very quickly, sometimes even overnight. The tank is lit by a 4 ft. Gro-Lux tube and has a power filter at one end of the tank.

Belontia signata is called the Comb-tail Paradise fish and it originates from Sri Lanka. The natural habitat is still waters with lots of vegetation, so your particular set-up sounds ideal.

The full adult size is 13 cm (5 inches) so your male is fully grown. The breeding temperature is 28°C (82°F), so you should raise the temperature a little in your tank. Include some floating plants—this may help the male build a bubble nest, albeit a poor one. The pair will mate under this nest and the male will catch the eggs and put them in the nest. They hatch in about 48 hours, but the

Tropical

Breeding combtails

I have a pair of Comb-tails Belontia signata (Günther). I would like to know if you could give me any information on breeding these fish.

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female should be removed before this because the male drives her away. The male can be removed when the fry are free-swimming, after about 4 days.

The fry are fairly large and will take freshly hatched brine shrimps followed by crushed flake, etc. It is not until one month that the labyrinth forms but unlike Gouramis or Bettas, there is usually no problem at this stage.

If you use the main tank to raise the fry, it is best to remove the power filter until the young are getting large.

Molly tank

I am thinking of setting up a tank, either 2 ft or 3 ft, or Sailfin Mollies. I have read a few books and require information on the following.

Is normal gravel OK in brackish waters? Is one teaspoon of salt per 10 litres all right? Is undergravel filtration ideal? Should the fish breed fairly easily in these conditions? Are fish over nine months all right for breeding? Looking at

Sailfin in local shops in all but one shop the fish shook themselves regularly while stationary. I have heard this is a disease, if so, what causes it? Is it contagious? How can it be cured? Also, what plants withstand brackish water? How many fish could a 3 ft tank hold and what ratio of males to females?

The Sailfin Molly is *Poecilia latipinna* or *Poecilia velifera* and the ideal habitat is a well-planted tank at 25° to 28°C with clean water via frequent partial changes. That water should only be mildly brackish, just one teaspoon of rock salt per 10 litres of water, as you mention. Hence, normal gravel and plants can indeed be used. Power filtration (or none, with frequent changes) is better than undergravel filters.

Yes, the fish will breed at 9 months or more. Gestation is 8 to 10 weeks (sometimes less). The Mollies you saw were suffering from the 'shimmies', which indicates distress. This is caused by too high a bacterial load—probably because the tanks were crowded. It is cured

by improving the water quality.

Being livebearers, the male-female ratio is not important. To breed true and develop the best Sailfin, then just a pair will be selected and isolated. Your 3 ft tank will hold 50 young but should be reduced to about 30 as the Sailfins grow.

Your feeding regime of *Infusoria*, brine shrimps, then crumbled flake is ideal. Mollies are vegetarian so include scalded lettuce if algae are not abundant, and make the flake a vegetable diet recipe.

Koi

Tank to pond

I have several small Koi in an aquarium but am finding it difficult to keep the tank clean. I am about to build a small Koi pond and I wonder if you could advise me whether I could place the fish from my tank outside in the new pond?

You are faced with the

problem that everyone comes across. When their fish become too large for their quarters, it is difficult to maintain the water in the correct conditions for their continued health. The solution as you suggest is to build a pond for them.

Although your fish have spent most of their life in aquaria you will have no problems in getting them to settle in an outdoor pond if you treat them correctly. After the pond is completed and matured wait for a day when the temperature in the pond is the same as that in your tank. Then place the Koi in a polythene bag and allow it to float on the surface of the pond. Gradually fill the bag with water from the pond so that the Koi become acclimatised to the pond water. The fish can then be released into the pond.

This task should be undertaken as soon as the weather is stable in order that the fish have as long as possible to become adjusted to outdoor life. For the first winter it might be advisable to cover part of the pond to give the fish added protection.

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News from the societies

IMPORTANT NOTICE

Please submit items of news and diary dates for this page at least six weeks before publication, preferably earlier. Owing to late submissions, we have been unable to meet several societies' requests for inclusion this month. We apologise to the societies concerned even though the non-publication of the items they submitted was due to circumstances beyond our control.

Demand for space on this page is so heavy that we cannot, unfortunately, include detailed show results. However, we welcome brief reports on these and any other society-linked events and will continue to do our best to publicise activities and items of news. Thank you very much for your support.

Obituary

East London saddened

It is with much sadness that we report the death of our President, Mr. Frank Vicker, who died on 4 April 1988. Mr. Vicker was a keen member of E.L.A.P.A. for many years. His helpful nature has been gratefully appreciated by a great many members during the decades. He held many positions on the committee during his time with East London. Frank will be greatly missed not only by East London club members but also by many hobbyists and members of other clubs, and we all send our condolences to Mrs. Vicker.

Ken Stannard (P.R.O.)

East London Aquarists and Pondkeepers Association

Surrey Marine Aquarists Society

Due to circumstances beyond its control, the Surrey Marine Aquarists Society no longer meets at the Lakers Hotel in Redhill. The new permanent venue is the Methodist Church Hall, Station Road, Redhill. Meetings are on the first Tuesday of each month and further details can be obtained from Jan Sanders on Reigate 22689. Apologies to anyone who may have turned up at the old venue in the last few months.

New Cichlid Group Proposed

B.C.A. member, Herby Irons, would like to form an Area Group for Cichlids in and around Kettering (50-mile radius) and would like to hear from other Cichlid enthusiasts. If you are interested, get in touch with Herby at 10 Jean Road, Kettering, NN16 0PS. Tel: (0536) 520236.

North Avon Aquarist Society

The North Avon A.S. 7th Open Show is scheduled to take place on 14 June at the Hanham Folk Centre, High Street, Hanham, Bristol. Benching: 9.30-11.45 a.m. All enquiries to Mr. R. Cummins (Secretary), 1 St. Anne's Close, Cadbury Heath, Warmley, Bristol BS15 5EH. Tel: (0272) 677898.

Owing to an unfortunate collection of events, this year's Open Show clashes with another event. The situation was realised too late for rectification to be possible. Apologies to anyone inconvenienced.

Portsmouth Aquarist Society

The following Officers were elected at the recent A.G.M.: Chairman: Mr. C. Forse; Treasurer: Miss W. G. Ryder; Secretary: Mr. S. D. Forse; Show Manager and Organiser: Mr. W. Ryder; Committee: Mr. R. Birch, Mr. A. Palmer, Mr. A. Oakshott, Mr. J. Sykes, Mr. V. Hunt, Mrs. R. Froud.

Meetings are held on the 1st and 3rd Wednesdays of the month at Portsmouth Community Centre, Malins Road, Buckland. New members always welcome. Further information from S. D. Forse (Secretary), 114 Manners Road, Southsea, Hants., PO4 0BG.

East Kent Aquatic Study Group

Meetings of E.K.A.S.G. are held on the 2nd Tuesday of every month at the Beltinge Memorial Hall, Reculver Road, Beltinge, Herne Bay. For further details, contact Pat Edwards on (0843) 291750 or Tom Webb (Secretary), 64 Dane Road, Birchington, Kent, CT7 9QT.

Birtley Aquarist Society

The Birtley Aquarist Society has changed its meeting venue to the British Legion Club, Ravensworth Road, Birtley,

Chester-le-Street, Co. Durham. Meetings are held fortnightly (on Tuesday evening) starting at 8.00 p.m. Full details from J. Alexander, Tel: Tyneside 410 8929.

Diary dates

Tongham Aquarists

The 5th Open Show will be held on Sunday 29th June at the Recreation Hall, Ash Parish Council Offices, Ash Hill Road, Ash, Aldershot, Hants. For details and schedules contact Mr. Andy Pearce (Show Secretary), 4 Newlands Drive, Ash Vale, Nr. Aldershot, Hants. GU12 5EA. Tel: (0252) 25686.

S.M.T. Aquarist Society

The S.M.T. Open Show, Tombola, Raffle and Auction will be held at the Key Youth Centre, Town Centre, East Kilbride, on 8 June. Entries accepted from 10.00 a.m. to 1.00 p.m. Judging 1.00 - 4.30 p.m. Auction: 2.00 p.m. Further information from Mick Poulton (Show Manager), 69 Fereneze Crescent, Hillhouse, Hamilton.

Staveley & District Aquarist Society

The S.D.A.S. 3rd Open Show is scheduled to take place on 8 June. Contact Mrs. Caryl Yates (Secretary) for final details at 47 North Road, Clowne S43 4PG. Tel: Staveley 811220.

Arbroath Aquarist Society

The A.A.S. annual Open Show will be held at the Arbroath Community Centre, Marketgate, Arbroath, on Sunday 22 June. Full details are available from the Secretary/Show Manager, John Steven, 95 Brechin Road, Arbroath DD11 1TA. Tel: (0241) 76605.

Next month

COMING UP IN JULY:

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On the test bench

by Ian C. Sellick

Eheim 2113 Thermo-Filter

Eheim products have a considerable reputation for quality and performance. I have had the pleasure of testing one of the more recent additions to the range of external canister filters, the 2113 filter, with the addition of a heating element to make the 2113 Thermo-Filter.

All of my much-used Eheim units now have been of the old type with pump bolted onto the top of the canister and connected via a short piece of hose that often leaked. The new design, with modern styling, the bevelled pump head looking particularly the part, eliminates this as the pump is an integral part of the lid. The only external features of this lid are a red circular dial that controls the heater, and the filter outlet with a barb to hold the flexible hose firmly in conjunction with a screw ring-clamping device: a distinct improvement over the older models where even jubilee clips didn't always avoid leaks. This system, as used on a number of power filters nowadays, seems particularly good at firmly holding the hose in place.

On removing the lid (not normally ever necessary), it is revealed that the pump is epoxy encased, and the pump outlet mates with the pump body via an accurate moulding coupled with an O-ring. Few chances of leaks in the pump itself.

The pump head clamps on the filter body via 4 retained spring clips—a system Eheim have used for a good 18 years to my knowledge—a secure yet easy method. As has always been the case with Eheim, the filter canister takes in dirty water at its base, any very heavy dirt settling immediately in a 'sump' area, the rest of the water passing through whatever filter material is added above

the removable grille in the base (wool, carbon and plastic fibre matrix are provided with the unit). Thus the whole of the diameter of the canister is utilised, and water must pass through the filter material in an upward direction, always regarded as being the most efficient way. Removing the filter from your pipe system is always a problem with this arrangement, though, and usually necessitates inserting a couple of taps and a quick connect to avoid losing the inlet syphon, and avoid emptying the contents of the filter over the living room carpet. Perhaps these could be included, rather than be optional extras, as most shops do themselves no favours by not selling them to you!

Rated at 390 litres per hour, I obtained 300 litres per hour at 3 foot head on an empty canister, lower when filled with filter media. This flow rate makes the filter ideal for tanks up to 5 foot by 15 by 18 inches (say), for a community set-up, or a 4 foot for dirty fish such as cichlids.

As the 2113, the filter has a 180W heating element controlled by an integral thermostat that monitors the water temperature in the pump head by means of two thermistors just below the level of the impeller. As these sense the temperature of the plastic in contact with the water, not the water itself, I dispute the implication in the instruction book that temperature can be maintained to a few tenths of a degree Celsius. The electronic control panel can, on the basis of the thermistor's temperature generated resistance, switch on or off to this accuracy, but the tank temperature will depend on flow characteristics from the pump. If this is the only source of heat for the tank (and I strongly advise it shouldn't be), the

water from the filter must be returned in such a way that an end to end flow in the tank is achieved. This is not made clear, nor any guidance given, in the instructions.

For robust fish such as Oscars that tend to destroy glass heaters, and where internal heaters would be too unsightly, the Thermo-Filter has its advantages. The main disadvantage is that heating the tank is dependent on the pump working. If the filter stops for any reason, so does the heater (protected by a thermal cut-out fuse in case of overheating).

As a filter, this Eheim is marvellous, and cannot really be faulted; the built-in heater has limited application, but is useful as a way of circulating warmed water where conventional heaters cannot be used for any reason. The Thermo-Filter can only be used in freshwater due to the metal heating coil, a further restriction. Eheim products are not cheap, but the investment in them is always repaid in long service life. I would recommend this filter.

Tetra Delica

Three more rather super additions to the Tetra range of foods; a selection of freeze-dried natural foods as a 'treat' for all fish. Packed in plastic tubs, sealed with a foil lid, all are to Tetra's usual high standard. I found that all three; Bloodworm, Krill and Brine Shrimp, were composed of the food in question with virtually none of the extraneous matter often found in such foods. They were all very readily taken by a mixed community of freshwater fish, especially the Bloodworm.

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SPINY EELS AND THEIR RELATIVES



The Fire Eel, *Mastacembelus erythrotaenia* showing the characteristic Spiny Eel mouth

As a result of scant information available to aquarists, there is a deal of confusion about Spiny Eels which David J. Curran here tries to clarify

The true oddball fishes are those which are not normally classed as being part of the larger groups of fishes e.g. cichlids, catfish, barbs, characins, cyprinids, etc., although many aquarists consider some fishes within these larger groups as such. These true oddballs are normally collectively grouped under 'any other variety' or 'any other species' in the various show size booklets which can be found in Britain.

This lumping together of fishes within this group tends to lead most authors into a position where they will only give a passing mention to these 'forgotten fish', hence a lack of information available, and a lot of confusion over these species.

This absence of adequate literature has led me into investigating the type of fish in which I am most interested, namely the Spiny Eels.

Spiny Eels are elongated, eel-shaped fishes belonging to the order Synbranchiformes. In the past they have been placed in various orders and suborders, the most recently accepted order is still

thought by many to be the Perciformes. This change in their status was brought about by Dr. Robert Travers (1984, parts 1 and 2). Table 1 shows the changes in classification brought about by this work. A Synbranchiform relationship has been suggested by other authors too.

The Spiny Eels are primary freshwater fishes, which means that they both live and breed in fresh water and do not at any time enter the sea. It has been reported by various people in the past that these fish do not only inhabit fresh, but also brackish water. These reports must be met with some scepticism, as Spiny Eels in the wild very rarely frequent brackish water, and only the odd specimen has been found in such localities.

The distribution of these fishes is very widespread, as they come from Africa, Asia, and parts of Indonesia. In Africa they are represented by the *Afromastacembelinae* and are distributed from Sierra Leone in the west, eastwards to the Lake Chad basin and southwards, through the Zaire river basin, including

the Rift Valley Lakes, and in the Zambesi and Okavango rivers.

In Asia they are represented by the families Chaudhuriidae and Mastacembelidae. The Chaudhuriidae are found in the Northeast corner of India, Burma, and Thailand. The Mastacembelidae are represented by the Mastacembelinae, and are distributed from Syria, eastwards throughout Asia south of the Himalayas to Korea, and southwards through the Malay Peninsula into the Indonesian islands of Sumatra, Java, Borneo and the Celebes.

At least one species has been recorded from the Molluccas, although this is thought to be highly unlikely as these islands lie well beyond the Wallace Line (this was named after the biologist Alfred Russel Wallace in the 19th century to divide the Asian and Australasian faunas. The line was later altered by Huxley. The German biologist Max Webber later drew another line which he later modified, to take account of the fact that the faunas had indeed mixed, the area between the lines containing the faunal mixture, see fig.). It has been said that only those fishes with a recent marine ancestorship have crossed this line.

Spiny Eels can be found in a wide variety of habitats ranging from the still waters of lakes or slow moving streams and rivers, to the most severe rapid conditions. And the waters can range from slightly acid and soft to very hard and alkaline as in the Rift Valley Lakes.

As previously mentioned, the Spiny Eels are only eel-shaped fishes, and not true eels as thought by many people. In fact they are in no way related to the Anguilliform fishes such as Congers, Morays, the Common Eels, etc. They are now considered to be more closely related to the synbranchids or Swamp-Eels, a belief which is based on many similarities in their development and body structure.

The name Spiny Eel is not only descriptive of their shape, but also of their characteristic spines which are, in fact, the fore parts of their dorsal and anal fins. These spines have evolved from the hard bony rays which most fish possess. The dorsal spines are completely detached from the soft dorsal, and the anal spines likewise from the soft anal rays.

In the Spiny Eels the fins can have very high counts. The dorsal spines may be as few as seven in *Caecomastacembelus paucispinus* to as high as 42 in *Afromastacembelus tangamcaea*, and the soft dorsal rays can vary from 36 in *Macroganathus panchulus* to approximately 130 in *Caecomastacembelus greshoffi* and *C. liberianus*. On average the number of soft rays in the dorsal and anal fins are about the same. On the other hand, the number of anal spines is a great deal less than those on the dorsal. Most African and all Asian species of Mastacembelidae have three anal spines, a few of the African species have two, and only one—*Afromastacembelus ophidius*—has a single

spine. The only exception to the possession of spines lies in the genus *Chaudhuri* which have none.

The bodies of the Spiny Eels vary in proportion considerably. They can be either deep bodied as in the Asian species or very long and almost wormlike as in some of the African species.

In general Spiny Eels can be described as being fairly long and narrow with a long based soft dorsal and anal fins which may or may not be fused with the caudal fin. The vertical fins are preceded by a series of sharp, independent, depressible spines (again with the exception of *Chaudhuri*). These spines, in the case of the dorsal fin may reach as far forward as the head. Ventral fins are absent. Some form of fleshy rostral appendage is usually present (with the exception of *Chaudhuri caudata*), which may be very long as in *Macroganathus aculeatus*, or very short as in *Afromastacembelus ophidius* or *A. moorii*.

Sizes within the *Mastacembeloids* can vary greatly. In the *Chaudhuriidae* these vary from 60mm in *Chaudhuri caudata* to 196mm in *Rhynchobdella sinensis*; in the genus *Mastacembelus* from 370mm in *M. oatesii* to almost 1mtr in *M. armatus* and *M. erythrotaenia*; in *Macroganathus* from 132mm in *M. heishi* to 450mm in *M. maculatus* and *M. zebrius*; in *Caecomastacembelus* from 72mm in *C. latens* to 445mm (total length) in *C. ansorgii*; and in *Afromastacembelus* from 152mm in *A. platysoma* to almost 1mtr in *A. moorii*.

"The reliance of coloration for the identification... is a pre requisite for confusion"

Scales are very small in most *Mastacembeloids* but are absent in *Chaudhuri*, *Caecomastacembelus anceps*, *C. crassus*, and *C. latens*; and restricted to the posterior third of the body in *Afromastacembelus micropectus* (which is so named due to the fact that the pectoral fins are very reduced, and in some specimens, absent altogether).

Coloration in Spiny Eels can also vary considerably, even between individuals of the same species, and this has led to some confusion in the past. Two classical examples of this are in *Mastacembelus armatus* and *M. erythrotaenia*, both of which I would like to cover at a future date.

The reliance of coloration for the identification of Spiny Eels is a pre-requisite for confusion, as many Spiny Eels have not been studied enough to establish variations within each species, and some species can so closely resemble each other that a positive identification cannot be made. The only sure method of identification is by counting the spines and rays in the fins, or by dissection.

The latter is obviously beyond the scope of the average aquarist.

During my researches into these fishes it has come to my attention that there has been a great deal of confusion surrounding the naming, both generally and scientifically. Every part of the world has its own common name for various fishes and the Spiny Eels provide no exception as they have a great number of names by which they are locally known. These names will differ according to species, dialect, race, and locality, but the names I am concerned with here are those most commonly used internationally.

There is only a handful of names used to refer to the Spiny Eels as a whole. These are Arrow Beak, War Beak, Mud Eel, Elephant Trunk Fish and, of course, Spiny Eel. No doubt I will be furnished with other names in due course. Most of these names are not widely used, and although I have come across the name Elephant Trunk Fish a number of times, I still feel that this is quite inappropriate as it is more commonly used to describe the mormyrids.

I think that Arrow Beak and War Beak, although being more descriptive of the Spiny Eels, should not be used as they were derived from an early translation of the name *Mastacembelus*, which was as follows: Mastax (-akos) meaning jaw or mouth, and Belo meaning a spear. The correct derivation was given by Sufi (1956) as Mastax (-akos) as above, and embelos meaning peg or wedge.

The common name used is completely up to the individual, although Spiny Eel is the most descriptive and most widely used. A number of common names are used for those species usually kept in aquaria and I have included a list here (table 2).

My fascination for these fishes has led me to reading a large number of hobbyist books and magazines, of which only a few even mention the Spiny Eels. I have found that by going back through early accounts, most books have taken their information from the earliest known sources of information, many of which are incorrect or misleading. Some fallacies should be corrected regarding Spiny Eels, some of which I will deal with here.

First, as I have mentioned before, Spiny Eels are not true eels. Secondly Spiny Eels are fresh—not brackish—water fishes. Thirdly, although Spiny Eels are carnivorous they are by no means all dangerous to other fishes. Those in danger by the larger specimens would be either very small fish or fry. I have read that Spiny Eels have scrappy dispositions, I would like to say here that the most common Spiny Eels, i.e. *Macroganathus siamensis* and *M. circumcinctus* are not the least bit aggressive, nor is the Fire Eel (*Mastacembelus erythrotaenia*) which at its full length would appear to be a most formidable opponent for all but the most aggressive tankmate. One of the commonly available species—*Mastacembelus armatus* (Tyre Track Eel)—on the other hand will promptly devour any fish small

enough to fit into its mouth, and it has a very large mouth.

Some fallacies should be corrected concerning the names themselves. The most notable being the insistence by authors to use names which have been placed in synonymy for many years. Some examples of this are: *Mastacembelus argus*—the Peacock Spiny Eel—which is really the Fire Eel *M. erythrotaenia*; *M. fava* or *M. armatus fava*, both of which names were given to a colour variety of *M. armatus*; possibly one of the most complicated mix-ups when investigating the taxonomy of the Spiny Eels, *M. pasciipini* (now in *Cacomastracembelus*), although this name was of a valid African species, it was often referred to as an Asian species, but these Asian fishes turned out to be *Macrog-*

nathus aculeatus.

Another aspect of the Spiny Eels which warrants attention is their ability to burrow into the substrate. I would like to mention that many species do not burrow, but will do so if provoked, but all Spiny Eels like to hide now and then. *Macrog-nathus circumcinctus* is a fine example of the non-burrowing type. I have three specimens at the time of writing which are between 15 and 17cm long and I assume them to be 1 male and 2 female (the females having far deeper and robust bodies). These fish rarely, if ever, enter the substrate and are in view almost all of the time.

Breeding Spiny Eels has posed a problem to aquarists, but it has not been impossible. Indeed, a number of species have been spawned in captivity, i.e.

Macrog-nathus siamensis, *M. circumcinctus*, *M. pasciipini*. Hence there is plenty of scope for the dedicated breeder who would like to try their hand at the other 60 or so species.

I hope to try and cover all these aspects more fully (plus details of the care of these fish in aquaria) in a future article.

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TABLE 1 The classification of the Mastacembeloids both before and after the revision by Travers (1984). With the present classification of their sister group, the synbranchoidel (after Rosen & Greenwood 1976).

Prior to Travers 1984.		
Order	Perciformes	
Suborder	Mastacembeloidei	
Family	Mastacembelidae	
Genus	<i>Mastacembelus</i>	61 species
Genus	<i>Macrog-nathus</i>	3 species
Family	Chaudhuriidae	
Genus	<i>Chaudhuria</i>	a single species
Genus	<i>Pillaia</i>	a single species
Genus	<i>Garo</i>	a single species
After Travers 1984.		
Order	Synbranchiiformes	
Suborder	Synbranchoidel	
Family	Synbranchidae	
Subfamily	Macrotreminae	
Genus	<i>Macrotrema</i>	a single species
Subfamily	Synbranchinae	
Genus	<i>Ophisternon</i>	6 species
Genus	<i>Synbranchus</i>	2 species
Genus	<i>Monopterus</i>	6 species
Suborder	Mastacembeloidei	
Family	Chaudhuriidae	
Genus	<i>Rhynchobdella</i>	a single species
Genus	<i>Chaudhuria</i>	3 species
Family	Mastacembelidae	
Subfamily	Mastacembelinae	
Genus	<i>Mastacembelus</i>	6 species
Genus	<i>Macrog-nathus</i>	11 species
Subfamily	Afromastacembelinae	
Genus	<i>Cacomastracembelus</i>	27 species
Genus	<i>Afromastacembelus</i>	19 species

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Right: A map showing the global distribution of Mastacembeloid Eels

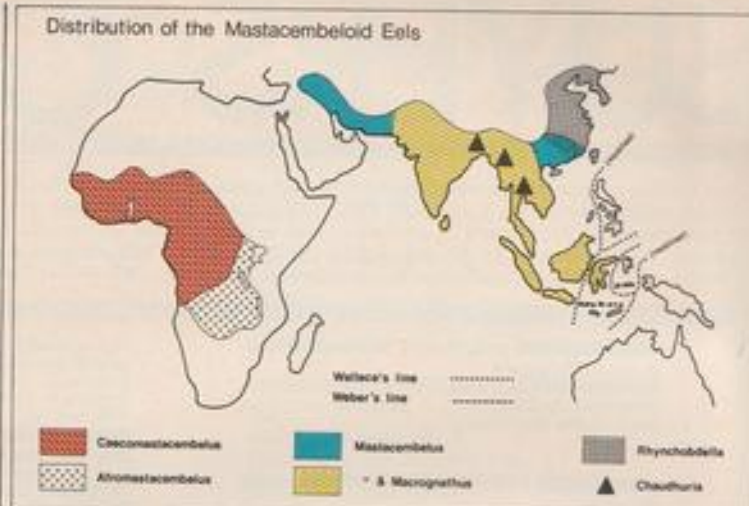


TABLE 2 Scientific and common names of some of the Spiny Eels which have been known to be kept by aquarists, including sizes (standards, unless otherwise stated), in mm and ins.

Scientific (proper) name	Common names	mm	ins.
<i>Macrogynathus aculeatus</i>	Lesser Spiny Eel Elephant-trunk Fish	350	13½
<i>M. siamensis</i>	Spiny Eel Clown Spiny Eel Siamese Spiny Eel	350	13½
<i>M. circumcinctus</i>	Banded Spiny Eel	250	9½
<i>M. maculatus</i>	Spotted Spiny Eel Black Spotted Spiny Eel	450	17½
<i>M. parcahu</i>	Deep-bodied Spiny Eel Spotted Spiny Eel Common Spiny Eel	200	7½
<i>M. zebrius</i>	Zebra Spiny Eel	450	17½
<i>Mastacembelus armatus</i>	Giant Spiny Eel Tyre-track Eel (A length of 1 metre is reported from the wild)	750	29½
<i>M. erythrotaenia</i>	Fire Eel Spotted Fire Eel Asian Fire Eel (A length of about 1 metre reported from the wild)	660	26
<i>Caecomastacembelus loenbergii</i>	Loenberg's Spiny Eel	200	7½
<i>C. brichardi</i>	Blind Spiny Eel	172	6½
<i>C. paucispinis</i>	Lesser Spiny Eel	388	15½
<i>Afromastacembelus moorii</i>	Moore's Spiny Eel Giant African Spiny Eel (A length of about 1 metre reported from wild)	720	28½
<i>A. tanganyicae</i>	Lake Tanganyika Spiny Eel (total)	240	9½

News

Aquatic News from the British Pet Industry Exhibition

The annual British Pet Industry Exhibition, organised by Pet Business World and the Pet Trade and Industry Association, took place at its usual venue in Harrogate, Yorkshire on 20 and 21 April.

As always, there was a host of new aquatic products on show, some of which had already found their way into retail outlets before the Exhibition, and all of which will be widely available by now.

Thomas's receives Queen's Award

Before getting to the individual products, though, a word of congratulations to Thomas's, the manufacturers of Aquarian and Atlantis, who received a coveted Queen's Award for Export Achievement. The official announcement was made during the Exhibition at one minute past midnight on the Sunday night/Monday morning.

What makes the award particularly significant from the aquarists' point of view is that this is the first time that such

an honour has gone to a company involved in the manufacture of aquatic products.

Aquarium presentations

During the Exhibition, two fully stocked aquaria were presented to local hospitals which cater for the disabled: The Yorkshire Home, and the Rivendale Ward at Whitley Hospital.

The stands, tanks and cabinets were donated by John Allan Aquariums and Tahiti Aquariums, while the fish were supplied by J.M.C. Aquatics and King British Aquarium Accessories Ltd. Other items, including plants, books, etc., came from Amphill Aquatics, Anglo Aquarium Plant Co., Hobbybooks, Interpet, Tetra and UNO Aquatic Products.

New and recently launched products

Here is a summary (arranged in alphabetical order, by company) of some of the new and recently launched aquatic products on show this year. We have tried to cover as many companies as possible. If, however, we have missed anybody out, please drop us a line with full details and we will attempt to bring your products to the notice of our readers as soon as space allows.

Algarde had two new, matt 3-D Interior Aquarium Backgrounds: a brown 'Fossil' design and a grey 'Strata' one. Both are intended for use in aquaria measuring 24 in., 36 in. and 48 in. in

length and 15 in. in depth and are provided with facilities for hiding heaters, airlifts, etc. Full instructions are available, including guidance on how to assemble '2-piece backgrounds'.

Anglo Aquarium Plant Company Ltd. A new model of their now-famous tumbling cascade plant display unit was on show. These units have revolutionised the way in which plants are displayed in shops—so watch out for the latest version in the coming months.

Batsford Products. Well-known throughout the hobby for a wide range of products, including aquarium decorations, Batsford displayed their latest addition, the HMS 8 Shipwreck.

Hagen (UK) Ltd. Among the new products from this company were the most recent Nutrafin Tropical and Goldfish Mini Pellets, the latest popular Starter Kits, a battery-operated Aquarium Cleaner, a Cable Control and an Aquaclear 2000 External Power Filter which can be adapted for undergravel power filtration.

Hobbybooks. Among their several new acquisitions was Dick Mills' latest book, *You and Your Aquarium*, reviewed in A & P this month. It was voted the best aquatic product among those entered for this award.

King British displayed their recently-launched and already successful Easycare range of pond treatments (already featured in A & P), plus their newest model of undergravel filter (System 3).

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Interpet had several new products on show, including a range of five pondwater treatments which were highly commended, the new Marathon canister power filters and their cascade-type, external Whisper Power Filter with its novel approach to biological filtration (the Bio-Bag).

Lotus. The newest addition to the highly successful range of pond pumps, the Otter Prince Submersible Pump, made its first public appearance at the Exhibition.

Minireef Aquarium Systems exhibited several combinations of this recently-introduced, sophisticated aquarium system, including fully operational freshwater tropical and marine aquaria which attracted a great deal of attention.

Norfine, famous for their nets, unveiled their latest product, a framed pond cover that is attractive as well as easy to erect and dismount. More about this in a later issue of A & P.

Remanoid launched a brand-new octagonal, 7-foot, surface pool which is extremely easy to assemble, has no nuts, screws or bolts, is supported by a double-skin, reinforced PVC liner, has a solid mahogany surround and requires no digging.

Rosewood showed off their new off-the-rod aquarium backgrounds depicting two freshwater scenes (one in which green plants dominate and another in which red is the overriding colour) and a marine seascape of well-known corals.

Two fully stocked freshwater Minireef systems



Tahiti Aquariums had a number of new products, including their latest Marina Hood, a Junior Aquarium (highly commended for packaging), an Alloy Hood and a very welcome, non-toxic spray Glass Cleaner.

Tetra concentrated largely on foods and remedies, launching a 1-litre tub of TetraPond Floating Koi Sticks, TetraPond MediFin for the treatment of White Spot, Fungus and Fin Rot in ponds, and three new aquarium remedies under the Tetra-Medica label: ContraSpot, FungiStop and General Tonic.

Underworld Products Ltd are the UK agents for Del Products and introduced Oxy-Parazon, from the Aquadel range, for the prevention of, and to

combat, parasites in freshwater and marine aquaria, at the same time enriching the oxygen content of the water and improving plant growth.

UNO Aquatic Products Ltd had an addition to their range of heater-stays—the new Reliant, fitted with silicone washers and designed to reduce the risk of breakage by preventing the heater element from touching the sides of the glass tube.

Waterlife Research Industries Ltd exhibited their two recently-launched water treatments: the Waterlife Deioniser for softening water and the removal of aluminium, lead, copper and nitrate radicals, and Waterlife Acid Buffer designed to prevent the acidity of water dropping below pH 6.5.

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