

AQUARIST & PONDKEEPER

FEBRUARY 1997

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Inside
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Supplement
ALL ABOUT THE
TROPICAL
AQUARIUM



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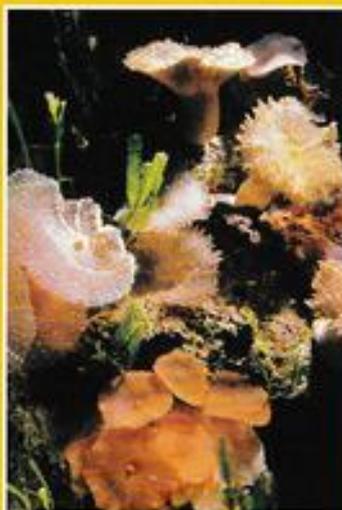
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COVER PICTURE



It is hard to believe that this underwater coral garden can be propagated by taking cuttings just like a terrestrial herbaceous border. Read Greg Sykes' article inside to find out more!

Photo: M.P. & C. PRONDOR



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Comment

One of an Editor's more painful duties is having to admit to mistakes — usually not too often and usually over nothing more than a misplaced caption or two. However, this month it is to apologise to our readers and advertisers everywhere for the serious lateness of the last issue of A&P.

Immediately before Christmas there was a severe staff crisis at MJ Publications Ltd which resulted in the actual printing of the already prepared editorial contents of the magazine being badly affected.

Naturally, at this time of year when everything shuts down for a self-inflicted ten day holiday, nothing could be done to alleviate matters until 1997 had arrived.

I am happy to be able to tell you that A&P is not about to emulate any bottom-hugging characteristics of many of its subject matter fishes but is continuing as usual. However, we have a tough task ahead in 'catching up' with the continually advancing clock, although it is hoped that normal publication dates will be achieved before too long. We would ask that all our subscribers, readers and advertisers bear with us during this period.

The bright spot is that we've got our usual interest-packed February issue out for you, including this month the first of our Supplements which is looking at Tropical Aquariums, thanks to our steadfast band of contributors who have been equally as anxiously concerned as anyone else over recent developments.

Oh, yes, just to add to the problems, I've had the 'flu for a couple of weeks, another factor which seems rife at present and regrettably also accounts for the omission of the Synodontis article which had been planned for this issue. We hope to feature this at a later date.

EDITOR

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CORAL

An Alternative Coral Reef

GREGORY R. SYKES
DESCRIBES HOW TO PROPAGATE
YOUR OWN COLONY OF
CORALS

PHOTOGRAPHS BY THE AUTHOR

Tree Colonies, *Dendrostephya* sp. (left) and a Gorgonian (right), with various Mushroom Anemones covering the base rock. *Lobophytum nasum* (bottom left and upper right) and *Sinularia* sp. (bottom right) are also featured.

healthy parental colony (Paletta, 1992). Use a sharp, new razor blade to trim a protrusion or edge off the colony. This piece should be minimally an inch in length. Usually, the larger cuttings have a greater chance of survival. The cutting is either wedged between some rocks, placed in a hole previously drilled into the rock with carbide bits, or set on a surface and gently strapped in place with fishing line (rubber bands deteriorate in water). If I plan to trade the piece I set the cutting on a large shell or small rock and keep it confined in a clear, hole-drilled plastic container in my aquarium. Cyanoacrylate glues are also an excellent means of securing most

CORAL PROPAGATION

Coral culture should only be performed in a healthy, established aquarium with excellent water quality and full-spectrum lighting

conditions. Ammonia and nitrite levels must be undetectable and nitrates should be below 10mg/L. No filament or 'Hair' algae should be present, which thrive in nutrient-rich environments. Full-spectrum lighting assists growth of the cutting and healing of the parent. The actual excision process is a

stressful procedure and, if the aquarium conditions are less than ideal, both cutting and parental colony could die. Under good conditions, the success of the culture may be realized as early as several weeks.

The common method of propagating Leather Corals and Tree Corals is by trimming a piece from a

corals and rocks (Headlee et al., 1996). These 'Super Glues' are best used by removing the coral and a clean target substrate from the water, lightly blot drying

removed from an edge or the base the specimen usually develops into a colony. In the latter case, polyps begin to develop several weeks after the initial

more sensitive than *Lobophytum*, include *Simulans* (Leather Corals), *Cladiella*, and the fragile *Dendronephthya* and *Lemmalia* (Tree Corals). *Lemmalia* also

could perish unless the surrounding conditions are optimal.

Some coral species equally capable of aquarium culture have sizable, distinct polyps growing in mats.

With genera such as *Xenia* (including Pulse Coral) and *Clavularia* (Star Polyps), transfer a section or a portion of the mat with a razor blade onto the desired surface. Care must be taken not to injure the polyps. The mats attach most readily if they are gently wrapped with fishing line. If only several polyps are transferred they may be wedged into a rock crevice. In less than a year I have had an entire rock covered with a *Xenia* colony stemming from a single parental polyp!

Colonial Anemones and Mushroom Anemones can be cultured under the same aquarium conditions as described for corals. My past experience with raising *Parazoanthus gracilis* (Yellow Colonial Polyps) and various species of *Rhodactis* and *Actinodiscus* (Mushroom Polyps) has been phenomenal. The *Parazoanthus* can usually be transplanted into small crevices. A successful (though primitive) means of attaching Mushroom Cnidarians is by placing the anemone in a Clam shell or a rock's shallow concavity and carefully setting a

CULTURE

Alternative to Reef Harvests

and placing a glue drop on both the coral's base and the desired surface, gently pressing the two applied regions together, and placing the newly attached cutting back into the water. The entire process should take 20-30 seconds. These adhesives are good for permanently holding most Leather Corals and Coral Mats into place — the colony usually grows over the glued area and further attaches to the substrate.

However, the glue is not effective for the prolonged holding of animals which secrete a heavy mucus coating, such as *Cladiella* (Clot Coral). Such species are only held for approximately 24-48 hours.

Employing these techniques I have had the greatest amount of success with *Lobophytum crassum* (Pink Lettuce Coral). Whether the piece is

cutting.

Edge pieces smaller than a dime have matured into colonies. The risky technique of slicing directly down the parental coral's centre (Paletta, 1992) has always worked on this species. If the coral is permitted to grow undisturbed it will eventually divide itself in half. Other genera for which I have successfully used the excision method, though

self-propagates by forming large branches at its base. These stalks can be gently removed from the foundation and transplanted. *Dendronephthya* easily produces viable offshoots from clippings or grows new polyps from base tissue, and initial growth may be evident even in a poor aquarium habitat. However, it is a sensitive genus to environmental stress and the newly forming colonies

Lemmalia sp. (left) sprouting basal branches surrounded by Green Mushrooms Polyps (right and background).



MARINE Coral Culture

second light, smooth rock over the polyp. Within 24-48 hours the Mushroom Anemone is sufficiently attached to the substrate such that the rock may be removed. After several more days the polyp will be completely attached. This procedure should be used cautiously because both light and water circulation are greatly reduced. Ironically I have not had as much success with clear plastic or glass sheets substituted for the second rock.

Unlike coral cultivation removing sections from Colonial Sea Anemones either does not produce an animal or the parental organism dies. Under optimal tank conditions these animals will reproduce via budding. Once a carpet becomes dense individual polyps may be thinned and placed on a new substrate. Some of the moderately sized Sea Anemones, such as *Bartholomea annulata* (Curlieue Anemones) are able to be propagated by cutting basal segments.

However, the best way to grow most Sea Anemones is weekly or bi-weekly feedings of Krill or Squid. Eventually the animals become large and split themselves. Caution should be used if the food is purchased from a seafood store: the invertebrates may have a malaise reaction if the meats are laced with preservatives. Another consideration is the sea anemone feedings will result in more wastes

polluting the water.

The aquarist must remember that, unlike Coral, Sea Anemones are mobile. I have had one incident where several different Sea Anemone species wandered near each other. Despite the fact they never touched they detected the other species and began releasing their nematocysts. Not only did the sting injure the conflicting anemones, it also temporarily injured corals around the battlefield.

If an aquarist is to work with Stony Corals or keep Tridacnid Clams, very high output (VHO) fluorescent bulbs or daylight metal halide bulbs (at least 5,000⁰ Kelvin) should be selected. With this lighting the tank is illuminated for 12 hours per day, with all the bulbs lit for eight to 10 hours (Thiel,

1989). The conventional fluorescent lighting will not emit an ample supply of light. Strontium and Iodine, in addition to Kalkwasser, should supplement the aquarium (Cook, 1995). My aquarium is currently established to raise Soft Corals, but I have experimented with calcareous species. The *Porites* specimen was growing fantastically along with its accompanying *Spirorbanchus* sp. (Christmas Tree Worms). I documented its growth on a monthly basis, regardless of the fact that the genus grows slowly. Unfortunately, I had to remove this piece because it had a hidden, unidentified species of nocturnal polychaete drilling through the coral and devouring

both polyps and ornamental worms.

Theoretically, cultured corals from pure stocks will not contain such devastating parasites. Other stony species an aquarist could consider include *Acropora* (a genus containing some of the fastest growing reef-building corals), *Pocillopora* and *Favites*. Sprigs from these corals may be broken and transplanted in the aquarium. The genus *Tubastrea* includes several resilient, calcifying coral species and, due to its absence of *zoocanthellae*, does not require strong lighting. Many aquarists have trouble keeping this genus because each polyp must be

individually fed a piece of shrimp on a weekly basis. I have not heard of successful, artificial separations occurring in hard corals having larger polyps, such as *Catalaphyllia* sp. (Elegance Coral).

FUTURE PROSPECTS FOR CORAL CULTURE

Aside from the described asexual means of reproduction corals have been made to sexually propagate in the hobbyist's aquarium (Cook, 1995). Depending on the species, the latter is usually more difficult to achieve: the seasonal cycles should be amplified; lunar phases should be included; and, much of the gametes/planktonic larvae are sucked into the filtration system before they can be collected or settle onto the substrate.

Large-scale greenhouse coral propagation has been accomplished in Detroit, Michigan (Perrin, 1993).

A wide diversity of marine invertebrates is cultivated within this facility. Thousands of gallons are used in conjunction with direct sunlight allowing more natural conditions than in home aquariums. Under these conditions the vats do have an undergravel system, but promoting/harvesting macro-algae (which absorb dissolved wastes) and massive aeration maintain a healthy habitat. The water is subsidised with trace elements. Only a few livestock distributors have recently started selling exclusively captive-bred invertebrates, but this trend is building momentum.

Not only would full scale greenhouse cultivation be able to supply the aquarium industry, environmental applications could stem from this programme. Conservatory research conducted by Guzmán (1991), which was directed toward human-inflicted reef



Colonies of *Leptophyllum crassum* (foreground) growing with *Clavella* sp. (background).

damage, suggested transplanting various coral species onto a destroyed reef framework. The test colonies grew and proliferated thereby accelerating the natural recolonisation processes. Unfortunately, the transplanted colonies were chipped from an existing reef system; injury occurs to one coral outcrop to help rebuild a second reef. A cross between this greenhouse and Guzmán's restoration program would permit coral re-seeding without damaging an existing reef. To prevent an intrusion of exotic species, such a cultivation/restoration program must exclusively consist of indigenous organisms to a given region.

The marine aquarium's future is filled with change. Not only are new technological advances in lighting, filtration and maintenance bound to surface, the animals

highlighting the mini-reef will emerge from an artificial environment. The survival of this intriguing industry relies on its self-perpetuating ability.

Perhaps, in the near future, the day will come when aquarists will repay injured reefs with cultivated corals.

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Some Do's & Don'ts of Koi Keeping



BARRY GOODWIN TAKES A LOOK AT SOME PRACTICES THAT COULD STAND CLOSER SCRUTINY

PHOTOGRAPHS BY THE AUTHOR

Life in a pond can be a hard existence for Koi and this is sometimes made a lot harder because the pond owner may not have troubled to find out what the essential needs of his Koi are throughout the various seasons of the year.

Having said that, I will be the first to admit that finding out what to do is not always as easy as it may at first seem. Whilst there is a lot of information circulating in books and magazines some of it seems to be conflicting, and quite often the poor hobbyist is at odds over which path to follow.

Perhaps the best clues to correct husbandry can be gained from studying the conditions under which a carp lives in a wild environment, and then looking at how these conditions can be applied to a pond, deciding what extra measures we must take to compensate for any that we cannot duplicate.

By the time that you read this your Koi will be experiencing those seasonal conditions (rapid rises and falls in temperature) where if the wrong decisions are made then their health and possibly their lives could be at risk.

Obviously this is a good point in time for us to look

at some of our practices and see just how much we are doing (or not doing) that is right for our Koi.

ESTABLISHED 'DO'S AND DON'TS'

It never ceases to amaze me just how many practices seem to owe their continuance to tales passed on from Koi keeper to Koi keeper through the years. Salting the pond for the duration of the winter, not feeding below 50°F (10°C), turning down the pump speed or indeed turning it off for the duration of the winter, a complete strip down and clean out of the

filter in springtime, and altering filter intakes to feed mid water during winter. These things and more still go on, and are probably collectively responsible for the lack of success that many hobbyists seem to meet with.

THE USE OF SALT

Salting the pond for the duration of the winter is an old practice which is still followed today by an amazing number of Koi keepers. When you think about it, however, Koi are freshwater fish, you don't find any of them living in salt or brackish water through choice anywhere in

the world. There are of course seeming exceptions such as in Hawaii and other such places but in reality these Koi have been placed



A winter cover such as this (above) enables the Koi, which can be seen swimming in the upper water layers in December (below), to be fed almost all year round.

- It is said to reduce the susceptibility of Koi to ammonia and other forms of toxicity.

Whilst these claims bear some truth, in reality if we do salt our ponds then we are only forestalling one set of problems and possibly opening the door to others.

By maintaining a clean and properly filtered environment coupled to correct percentage water changing we can forestall a lot of the 'expected' problems without the addition of salt to the pond. Salting a pond is also dangerous in other ways:

- You will need a means of measuring just how saline the environment is. You will need to replace salt when you carry out percentage water changes, and without a means of measurement you will never know how much replenishment is needed. Also most hobbyists who do this will tell you that they get rid of the salt during the summer. How do they do that I wonder, because if it is accomplished by

percentage water changing, then it will take a very long time to flush it from the system, if ever this is possible before the next winter's application is due. This further application of salt could then be adding to an already present salt level and this could be compounded year by year. If you must use salt, and I can't convince you otherwise, then at least invest in a suitably calibrated hydrometer.

- The need will arise for the pond to be medicated at some time, possibly in the spring or autumn, and the chemicals that we need to employ may not be compatible with salt, in fact they can sometimes be injurious to Koi when combined with salt.
- If ever the need arises for anaesthesia to be undertaken, then a salt content is not advisable in the water. It is also a dubious policy to subject your Koi to an environment where the salinity is constantly changing, this gives little chance for the Koi to adjust its metabolism for

any period of time to a stable environment.

STOCKING LEVELS

We can also look at our stocking level of Koi in the pond and seriously assess if it is too high, for this alone can be a cause of many pond problems. We will probably find that our stocking level is too high, as in reality most hobbyists are overstocked, especially when they have been keeping Koi for some time and their original tiddlers, with which they were originally understocked, have grown on to become larger Koi.

The correct stocking level for Koi is 50in of large Koi per 1,000 imperial gallons of water if the filtration system is between 1/3 and 1/2 of the pond size. Of course smaller Koi can be stocked to a greater extent because they do not have the capacity for producing the quantities of waste that larger Koi do, but returning to the previous paragraph they will grow quickly and then you could run into an overstocking problem without realising it.

in saline environments by human hand. The fact that they survive owes more to luck than any form of informed judgement and I suppose it goes to show that Koi are harder than we think!

Keeping freshwater fish in a saline environment is done for a variety of reasons:

- It is said to reduce the possibility of parasitic or bacterial invasion.
- It is said to increase the tolerance of Koi to colder water.



KOI Some Do's & Don'ts

FEEDING

Not feeding your Koi below 50°F (10°C) is also a widely accepted practice, and this can mean that your Koi are perhaps unwisely starved for an excessive period of time.

On the other hand, you will see that some of the food manufacturers are now advertising food for 'all year round feeding', so where is the dividing line between truth and folklore?

A Koi does not have a stomach, therefore digestion is carried out in a continual process throughout the gut, and this will happen down to approximately 43°F (6°C), and in a stable environment, this is the temperature to which it will naturally feed.

It does choose its food carefully, however, and will select the lower protein natural food at such times, and this is echoed by the low protein wheatgerm foods that have been available for Koi keepers to purchase for some time. These are easily digestible and remain in the gut for a very short period before the waste matter is passed through.

It is fairly safe to say that a Koi will not eat food below the temperature at which it can be digested, but this relies to a great extent on instinct. Instinct is inherited from patterns imprinted over untold time, spent during hundreds of generations of carp in the 'wild' which is less environmentally aggressive than a pond.

Unfortunately, this instinctive behaviour does not yet extend to Koi in an artificial pond where greater temperature fluctuations, than there are in natural surroundings, will undoubtedly be experienced.

It is in the earlier days of Koi keeping that the 50°F (10°C) rule was established, and it was also in these days when the more acceptable

lower protein wheatgerm foods were not so readily available. Also ponds were not so large as the average pond appears today and all these considerations must be taken into account when deciding on a temperature for the cessation of feeding in your own pond.

If we consider small ponds to be below 3,000 imperial gallons, and large ponds to be above 3,000 imperial gallons capacity, then we can look at whether the pond is protected from the elements, and whether or not it is covered and possibly heated to make our decision.

This was adequately covered in my article 'Preparing for Winter' which was published in *Aquarist & Pondkeeper* in October 1996.

PUMPING SPEED AND FILTER MATURITY

Turning down the speed of your pump for the duration of the winter is a chancy practice at best, and turning off a filter could lead to even worse disaster.

The maintenance of a mature filter is paramount, and a filter does much more for your pond environment than simply oxidise the ammonia content to nitrate. It can take a couple of years undisturbed running to produce a fully mature filter and turning it off for the winter period will certainly mean that you have to start from scratch again every spring. Therefore, you will never have a filter with a greater maturity than six months. Likewise, turning down the speed of the pump for the winter could allow undesirable bacteria or other pathogenic organisms to find haven in the filter. These could be flushed into the pond when the pump speed is increased again and cause all manner of problems.

By leaving your pump and filter running at the

A mid water feed to your filter as seen here is alright if it is used all year round, but beware of changing water flow patterns during the winter.



KOI Some Do's & Don'ts

same speed throughout the year you will ensure that your system achieves and maintains its peak of efficiency at all times.

Completely stripping a filter each year for a 'spring clean' is something that no self-respecting Koi keeper should consider. For the same reasons as above this will completely destroy the biomass that you have so lovingly built up over the months, and starting again could bring on all of the 'new pond syndrome' problems which are certainly to be avoided at all costs. A lot of people say that they switch off filters because of the running costs, but if you lose a Koi or two in spring because of it then you have wasted a lot more money than your pump would have cost to run — an acute case of false economy it would seem.

If you do have a filter which needs this sort of drastic maintenance then it may be better if you considered redesigning it to incorporate flushes and better settlement to ease the problem. Your filter should be capable of being cleaned sufficiently without stripping it down completely, and

cleaning it by means of flushing should be done at least weekly during the summer and monthly during the winter.

MID WATER FEED

The alteration of water feed to the filter from bottom to mid water for the winter period is an interesting one. It obviously has its roots in the days when it was believed that there was a layer of warmer water at the bottom of the pond during winter due to a thermocline establishing itself. Of course, temperature stratification will occur in large bodies of water but, in truth, a pond is too small for this to happen as the water movement generated through pumping,

and by the Koi as they swim and displace water, is enough to disperse any temperature gradient from top to bottom. It is instinct that drives Koi to the lower layers of water during the winter, and even when Koi are sitting on the bottom, they are not totally immobile. If you view them at intervals throughout the day then you will see that they constantly move their positions, and, therefore, displace water.

Unless you always take mid water and not bottom water to your filter, changing to a mid water transfer is inadvisable as this will not clear polluted water from the pond lower level into the filter system, and this can prove hazardous for the Koi which, as can be

seen, are inhabiting this layer. It is better to continue to take bottom water and guard against the cold by other means such as ceasing aeration and turning off waterfalls, etc. It is also a subject for discussion whether or not continual change of water flow pattern in the pond is stressful for Koi, particularly when immune defences are lowered during the winter.

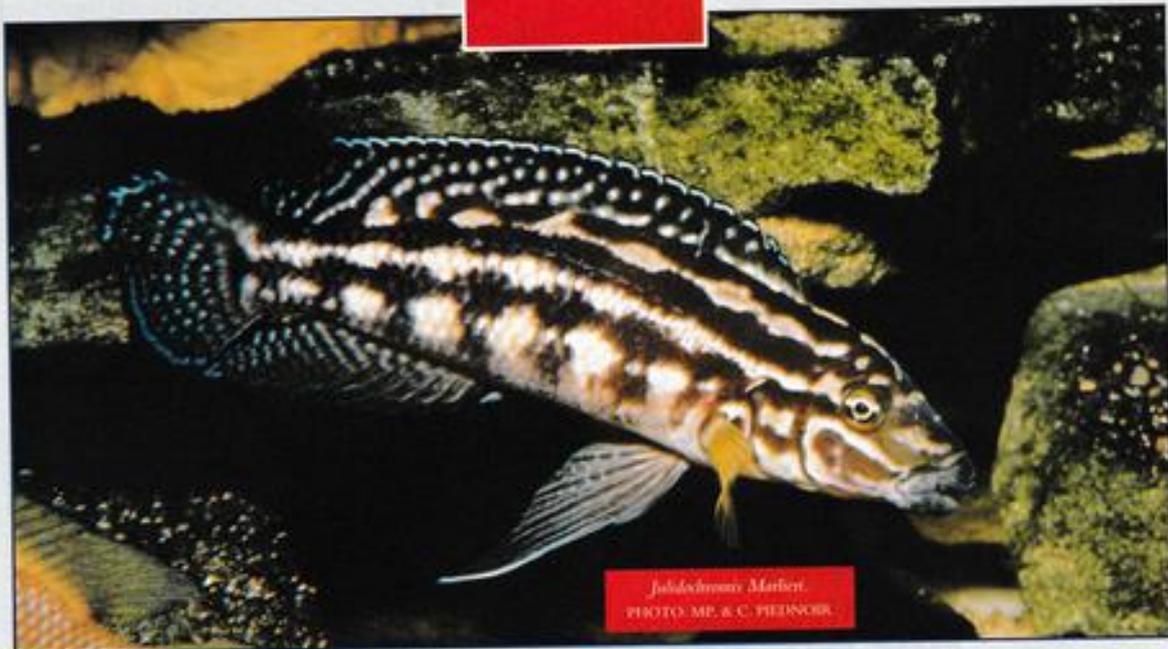
TO SUMMARISE THEN:

- Regulate the low temperature feeding of your Koi according to pond size, pond location, and water temperature.*
- Leave pumps and filters running at the same speed all year round.*
- Never strip a filter completely in springtime for a thorough clean.*
- Leave water feeds from the pond to the filter the same during the winter as they are in summer and protect against the cold by other means.*
- Only by continuously reassessing our practices in this manner in the light of present day knowledge will we increase our overall knowledge and amount of pleasure that we gain from this hobby.*

An exposed filter such as this will need insulation during the cold weather.



TROPICAL



How Many Julies?

The last couple of years have seen many new species of cichlid emerge from within Lake Tanganyika's depths. There have been many new colour forms of well known species, such as the blue *Cyphotilapia frontosa*, and new varieties/species of the *Neolamprologus brichardi* complex. One group of cichlids which has been relatively unaffected by increases in new species, and the general rush to buy, as any new fish to our hobby seems to create a sudden demand for itself, are the fishes of the genus *Julidochromis*. They are still ever-popular and the same species are still available, but how many species are there?

MARTIN CHANDLER TAKES A HEAD-COUNT OF ONE OF AFRICA'S ANSWERS TO SOUTH AMERICA'S DWARF CICHLIDS.

Well there are currently five described species of *Julidochromis* of which there are several different colour forms, none of these colour forms are yet described and they, much like the mbuna in Lake Malawi, have evolved from common ancestors but due to being separated for many thousands of years have different colour patterns. It has been argued that this means they are different species, but at present they are all referred to by the

same species name, with the addition of the collecting area to differentiate them, eg. *Julidochromis regani* 'Kipilli'. There is currently one undescribed species quite common in the UK hobby, that is *Julidochromis* sp. 'Gombi', this has been suggested to be a colour form of *Julidochromis transcriptus*, but at present is known by its trade name.

DISTRIBUTION

The cichlids of the genus

Julidochromis are in the main rock dwellers living their whole lives in close proximity to the many large submerged rocky reefs present in the lake. The exception to this is *Julidochromis regani* which is known to venture quite a way from the rocks over the sand. It is due to the fact that large coastline reefs of rocks are separated in turn by many miles of sand that the different colour varieties of species have developed. Each sandy stretch forms an impassable barrier to the *Julidochromis* species who are adapted for lives in the rocks.

When out in the open they become far more vulnerable to predators and are not built for escape as are most open water fish such as

those from the *Cyprichromis* genus.

Despite the huge size of Lake Tanganyika, species of Julidochromis are found lake wide. In fact the species *Julidochromis ornatus* has been found at opposite ends of the lake, that's some 650km apart! (Brichard, 1989). They became well distributed many centuries ago when the water level of the lake was much lower than it is now, and as the levels rose populations became isolated and evolved into the fish that can be found there today (Konings, pers. comm).

JULIDOCHROMIS SPECIES

As stated there are five described species and one undescribed so what follows is a brief description of each species to enable identification.

Julidochromis ornatus (Boulenger, 1898) — This must be the best known of all the Julies and the most commonly kept. Although having been in our hobby for many years they are still the species you are most likely to find on sale of this genus. It is considered to be a dwarf species and will reach about 3in TL in the aquarium. They can be identified from other members of the genus as it only possesses horizontal dark stripes that run the length of the fish from the nose to the caudal peduncle. It also has a bright golden yellow base colour. This base colour is much more vivid than in any other member of the genus. The only reliable way to tell the sexes apart is to look at the vents with the males being pointed and slanting back. I have heard it said that the females are always the largest of a pair, and then I witnessed a spawning from such a pair where the smaller — supposed male — laid the eggs? So using size

to sex them is not reliable.

Julidochromis marlieri (Poll, 1956) — This is the largest member of the genus with males reaching 5in TL and females 4.5in TL. It is not very tolerant in aquaria of the presence of any other 'Julie' in the same tank, and more than one pair can be very difficult to house in all but the largest of tanks. It is on its own a good addition to a community tank or the single species set-up. The base colour is yellow, the intensity of this colour varies in wild specimens due to geographical variation as already mentioned. It has also been noted that tank-bred specimens, several generations from wild — tend to appear very washed out. The yellow colour is overlaid with a criss-cross pattern of dark brown stripes. Again the colour and amount of these stripes can vary. Although the pattern is quite vivid in a well lit aquarium, one can imagine that in the murky depths against a dark rocky background the pattern provides good camouflage. Ad Konings has reported finding 50,000 pairs of this species on one rocky reef! In the wild they live in very close proximity apparently never straying more than a couple of feet from the rocks. Due to the crowding they have developed strong territorial behaviour which

is why it is best to keep only the one pair per tank.

Julidochromis regani (Poll, 1942) — This species was named after Charles Regan, one of the great ichthyologists who described many fish especially cichlids. It is considered by many to be the most attractive member of the genus and the race from Kippilli is certainly a spectacular fish. It grows to a similar size to *J. marlieri*, the colour and pattern is similar to *J. ornatus* except there are more longitudinal stripes and there is usually some vertical stripes on the caudal fin. There is a lot of geographical variance in this species with differences in base colours, thickness and amount of striping. What makes the Kippilli race so attractive is the presence of blue iridescence on the edges of the unpaired fins. This species does very well in a mixed Tanganyika community.

Julidochromis transcriptus (Matthes, 1959) — The smallest of the described species being only 2.5in TL. This species has a pale yellow almost cream base colour with horizontal dark face markings and broken horizontal body markings — many of which are formed into large blotches. This species is again suited to a general community of Lake

Tanganyika cichlids.

Julidochromis sp. 'Gombi' (Undescribed) — Another dwarf 'Julie' and possibly a geographical variant of *J. transcriptus*. This species can be easily recognised by the lack of horizontal dark markings on the body — there are two on the face. Instead it has dark brown vertical markings over a yellow base colour. The dark markings go around the whole circumference of the fish. This species is very peaceful (except to its own kind) and is a very good beginner's 'Julie'.

Julidochromis dickfeldi (Staeck, 1975) — The most recent described member of the genus and in my opinion the most drab. It is very similar in size and shape to *J. ornatus* but whereas the ornatus has a rich yellow base colour, *J. dickfeldi* has light brown. This overlaid with dark horizontal bars is not exactly anything to write home about when compared to the other members of the genus. It does have some bright iridescent edges to the unpaired fins and it is quite peaceful, these factors making it more acceptable for the community tank.

KEEPING JULIDOCHROMIS

If you wish to breed any Julidochromis species then it would be best to keep them in a single species tank which can be as small as 18x12x12in for the dwarf species. This can be quite handy for those who cannot afford or do not have the space for large aquaria. If you want to keep them in a display of Tanganyika fishes, then again all species are very suitable, however, they will become mildly territorial if they breed and



Julidochromis 'Gombi'
PHOTO: MARTIN CHANDLER

Growing Tips

BY
BARRY R JAMES

I am planning a new large planted aquarium in my house in Spain. After 35 years of experience in the field I want this to be my 'piece de resistance'. I am trying to amalgamate my own ideas with those of the outstanding aquarium designers of our time such as Gerhard Brunner, Kasper Horst, Takashi Amano and Arie de Graaf, to name but a few, who have contributed to our knowledge of aquarium plants and aquascaping techniques. Of course, I will not achieve perfection but I might come close!

The aquarium will be sited in an alcove to one side of the fireplace. The situation naturally lends itself to a paludarium, with the aquarium below and the

vivarium section above. The aquarium will be 36in long by 24in deep and 18in wide. With the aquarium 30in from the floor and the ceiling at 7ft 6in this means that the vivarium will be the same dimensions as the aquarium. The control, filtering and CO₂ equipment will be housed underneath, whilst the vivarium will have sliding glass doors. The local carpenter will take care of this for me.

The vivarium doors will be double-glazed to prevent condensation in cool weather. The plaster of the alcove will have to be removed and replaced with concrete with waterproofing powder added to the mix to cope with the high humidity in the vivarium. There will also need to be ventilation

panels above the sliding doors. The back wall of both the whole paludarium will be decorated with expanded polystyrene foam, volcanic rock and cork oak bark — the latter two items I can collect locally at no cost.

The technology which will be involved covers the following fields:

The Spraying, Misting and Fertilisation of the vivarium plants.

The provision of Substrates and A Fertilisation Regime for the aquatic plants.

Lighting
Aeration
Filtration
CO₂ injection
Heating
Electronic Monitoring and Control.



A furnished paludarium. PHOTO: DR DAVID FORD

THE SPRAYING, MISTING AND FERTILISATION OF THE VIVARIUM PLANTS

Terrestrial and epiphytic plants which will be planted in the vivarium need water around their roots to grow, but equally important is the maintenance of the correct level of humidity in the air surrounding the plants. Because the plants which I shall use will be derived from tropical forest regions where the humidity is somewhere in the region of 80 per cent it will be necessary to install a spraying and misting device. The temperature

to which the air must be cooled to keep the absolute humidity to a maximum is called the dew point. If it falls below the dew point the water vapour begins to condense on the coldest area. This would cause misting up of the glass, which will not be entirely eliminated even by double glazing. It is possible to buy cheap, uncomplicated devices called a hygrometer for measuring humidity. It is also possible to control humidity by means of a device called a hygrostat but these are pretty expensive so I intend to use a simple time switch which will give adequate control for most of the time. It is not necessary, in any case, for the humidity to

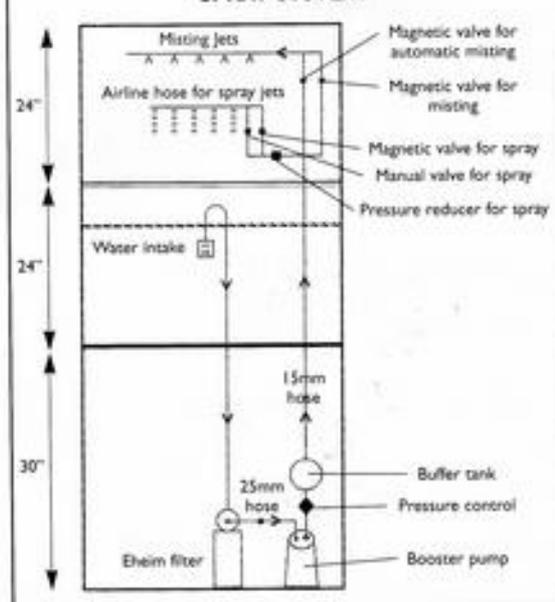
be constant as it varies a lot in the wild depending on the time of day, wind conditions seasons and other factors. The water will be drawn from the outlet of the filter thereby ensuring that there are no particles of dirt which would clog up the jets in the spraybar.

The misting system jets fine sprays of water into the atmosphere of the vivarium. The mist produced by the pressurised system has the appearance of fine smoke. As the system is only on for short periods the water is supplied via a buffer tank. A pressure-controlled magnetic valve keeps the buffer container at a consistent pressure of between 2.5 and 4 bar. Two jets will be sufficient and will be linked by plastic pipe to the buffer tank. The magnetic valve will be controlled by a time switch. There will also be a by-pass valve to permit manual operation of the system.

For many plants fine mist is not sufficient and will need a coarse spray which will be supplied via a second pipe running in parallel with the first. The water is fed in via simple aquarium air-valves glued into holes in a spray bar with silicone. Most of the components for this system may be obtained through horticultural supply merchants specialising in the technology of irrigation.

TO BE CONTINUED

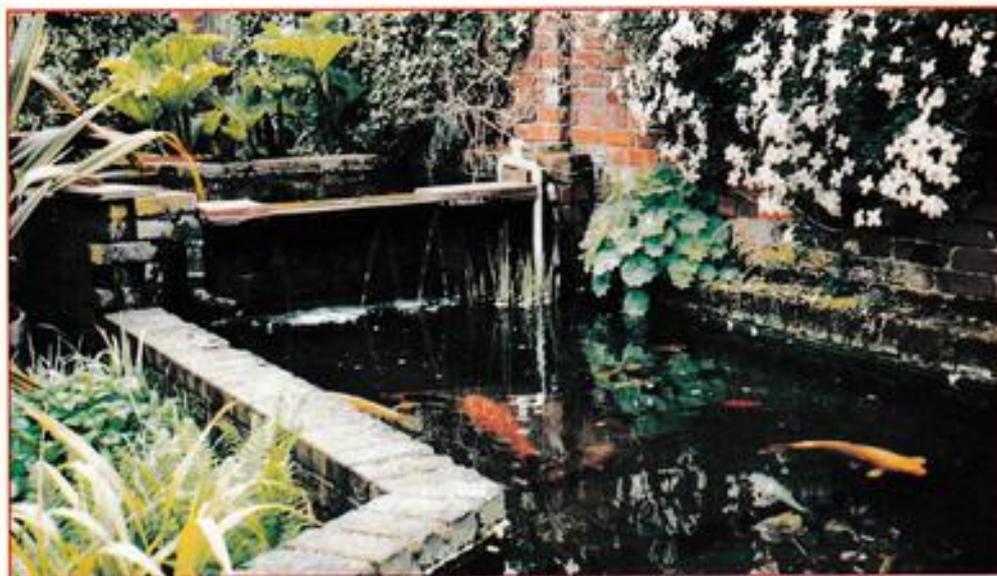
SCHEMATIC OF PALUDARIUM MIST AND SPRAY SYSTEM



WATER FEATURES FOR THE DISABLED

SUSAN STEPHENSON SAYS THAT PHYSICAL SHORTCOMINGS NEEDN'T RESTRICT ANY POTENTIAL WATER-GARDENER

PHOTOGRAPHS BY THE AUTHOR



Any garden is enhanced by the presence of a water feature. The sight and sounds of water are restful, therapeutic and calming and there is nothing quite like a pond or water feature to add interest and pleasure to the garden.

For those with physical limitations the presence of water in the garden can be especially beneficial. Physically disabled people cannot easily maintain a large area of garden but by maintaining a water feature they can have, in a small area, the benefits of wildlife visitors, fish and plants and

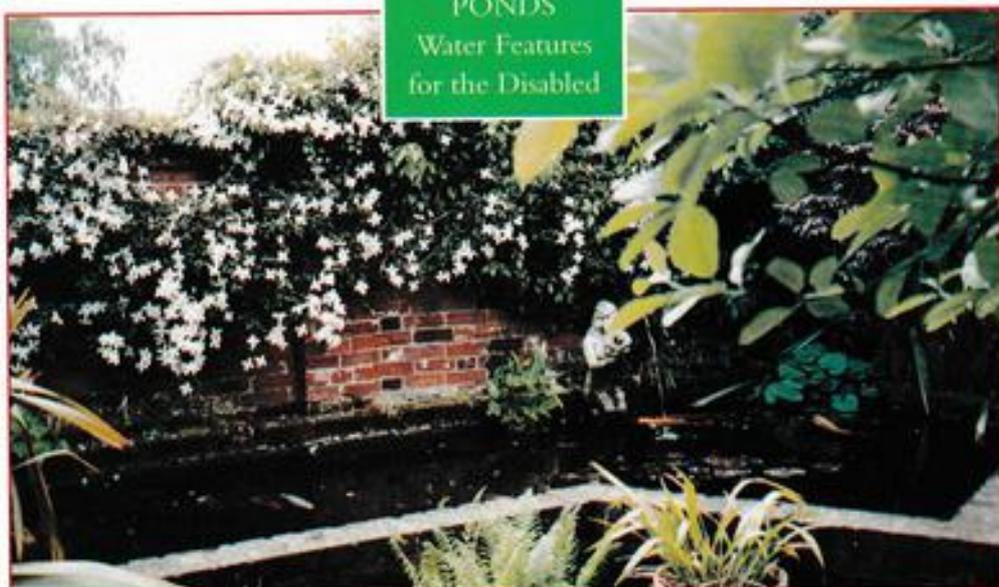
all the other benefits water brings.

If you or visitors to your garden have a disability it must be accepted from the outset that there will be some limitations when considering a water feature, largely for safety reasons. A very wide pond will not allow easy access if bending

is a problem and a pond without some sort of safety barrier is impractical if a wheelchair is used. The exact limitations will depend upon the mobility, whether assistance is readily available and the nature of the disability.

When designing water features with the elderly or

PONDS Water Features for the Disabled



disabled in mind the major considerations must be access and safety. Safety is paramount because these groups are more vulnerable in the garden and are further from help if they are working on their own. Therefore, the site for the water feature should be sheltered, out of the wind and, if travelling distance is a problem, as close to the house as possible.

Access to and from the water feature should be easy and practical. A ramp may be needed from the house to get access to the garden itself. If a wheelchair is used then the paths must be wide enough to allow easy turning of the chair. All paving or surfaces should be level and any obstacles such as tree roots should be removed. Any wires should be put safely where they will not pose a hazard or buried in conduits. The area around the pond should be safe and firm. Disabled people can get stuck in earth or grass, especially if in a wheelchair or after wet weather. Sharp corners in structures such as walls should be avoided if possible. A strong net just below the surface of the water is an additional safety

measure in case of any falls.

If a person in a wheelchair is going to be working at a water feature for some time, 'clamps' such as those used on children's roundabouts to hold chairs still might be an idea. These can be released by the user. Any structures to aid the users must be fitted by experts. If mobility is a problem but the user is not in a wheelchair hand rails might be provided on the way to or at the feature. A seat could be provided for the person to work at or sit by the pond. The shape of the pond might be designed so there are 'bays' where the user can be more sheltered and get closer to the centre to allow access to all areas.

Instead of a bog garden around the pond raised beds can make an unusual feature and because they are waist high they will allow the disabled access for maintaining the plants. Another idea is to place attractive potted plants on the wall surrounding the pond itself. Thus the wall itself provides an additional focal point. The detail can be varied by adding living plants and coloured pots.

As well as considerations when building the water

feature itself you need to consider the operation and upkeep of a pond. Structures such as the pump or filter housing should be accessible and switches should be easily reached by the disabled users. The pumps and filters themselves can be fitted with longer access handles so they may be easily removed from the water for checking and maintenance. A range of tools is available with extendable handles which make jobs like pruning and digging a lot easier. Long handled nets and ones with curved handles can be used effectively to catch any fish needing attention and feeding fish should present no problems. Good long sticks can be used to remove blanket weed and excess oxygenating plants from a pond. For holding pots when planting water plants an upturned tray such as a tomato tray with different sized holes cut in it makes a good holder. Handling a hose can be very difficult and dangerous if you are not mobile but you can adapt a hose to give it a thickened grip if you wish to use one. Taps should have a lever action instead of a twist thread. The aim is to allow users to carry out as many

jobs as possible, independently.

Raised ponds will offer access from waist height and these can be free standing water features or built into or against a wall. The wall itself can be of different textured bricks, trellised or contrasting materials to add interest. Just because somebody is physically limited does not mean their water features need to be simple. They may be anything from a simple raised bubble fountain or jets playing, to full blown projects such as varied levels or ponds and streams built against or into a wall.

Designing water features with disabled in mind can actually lead to more thoughtful designs such as a series of small ponds built into a wall in descending levels with falls and channels between the levels. As long as access and safety are considered carefully the scope of water features for elderly and disabled persons to manage is very wide.

One problem is that usually for a raised feature the wall needs to be at least a little higher than the water level so some bending is needed. Equally, a pond with high sides or deep

water will make access to clean and attend to the plants difficult.

A half-barrel with the front cut away makes an interesting water feature and provides enough surface area to grow water plants. Water features fit very well into a patio garden designed for disabled gardeners because the container for the water feature can be the same or designed to complement the other containers and troughs.

Of course the disability may not be one of physical mobility, but the loss of senses. For many people one of the joys of water is its tactile qualities and here again a raised pond will bring the water up to the level of the person.

For the blind pondkeeper safety is absolutely paramount. Markers can be

positioned which the user can feel to tell them exactly where they are in

relation to other structures in the garden. A definite slightly raised barrier around

the pond is a good idea to prevent falls. To a blind person the sounds and scents around the pond will be important. A trickle or small fountain is preferable long term to a gushing roar. Plants should be chosen for scent and feel rather than brilliance of flowers. For the deaf pondkeeper plants which are colourful can be selected.

Having a physical disability does not in any way make it impossible, with a little thought, to have an attractive and effective water feature to give pleasure and enhance the garden.



Tetra COMPETITION

Win a Tetrathec Heater and Go Tropical!

The popular range of TetraTec heaters are manufactured from Borosilicate — a heat and shock resistant glass — making them stronger than most other heaters. Designed to be suitable for all aquaria they are available in five sizes.

Maintaining the high quality specifications upon which Tetra insist, and conforming to European CE Regulations, TetraTec heaters feature a thermostat with an advanced nichrome heating element which not only provides more efficient and consistent heat distribution for the size and recommended temperature of your aquarium, but also lasts longer. A clearly-visible, and easily adjustable, temperature setting includes a safety 'click' control which



prevents over-wind. The beauty of a TetraTec heater is that you can just set it and forget it!

To win one of three heaters, choose from one of the five available models (prices start at £21.99): 75 watt/100 watt/150 watt/200 watt/300 watt, and complete the phrase below stating why you would like to win a TetraTec heater.

I would like to win a _____ (insert model) watt heater because

Please send your answers, no later than 10 March 1997, on a postcard to: Dept TTECH, Tetra Competition, PO Box 2162, Bournemouth BH2 5ZA.

SHORE WATCH



BY
**ANDY
HORTON**

With a bit of luck the first fine weather will coincide with the low spring tides during February, and the rockpooter will be able to be able to venture down on to the shore for the first time in 1997.

Exactly, what he, or she, will find will depend on the weather. Look out for Sea Slugs, the shell-less molluscs called Nudibranchs with some species coming into breed during the early months of the year. The spawn will be laid on the underside of rocks. Take care to return the rocks in exactly the same position as you found them.

During February the sea temperature around most of the British Isles will fall to the lowest of the year to about 7°C in the English Channel and as low as 4°C off the northern North Sea coasts of Britain.

Nutrition

After the essential water requirements of the correct temperature and sufficient dissolved oxygen have been satisfied the next most important factor to be considered by the aquarist is how is he going to feed the fish and other animals in his aquaria.

The responsible marine aquarist cannot rely on putting in proprietary foods and hoping for the best. The native marine

In the column for the coming year I will examine some aspects of the biology and behaviour of

the rock pool fish and marine invertebrates that are both interesting and useful knowledge for aquarists.

chain is helpful:

Primary production — involves 'autotrophic' organisms like the seaweeds and the microscopic phytoplankton (pastures of the sea) that harness the energy from the sun with water and carbon dioxide to

synthesise carbohydrates in the presence of chlorophyll, in the process called 'photosynthesis'. Other mineral salts are also necessary for growth. This stage of production is only rarely possible in the artificial environment of marine aquaria.

Secondary production — is the feeding for 'herbivorous' animals on the plant production in the sea which includes the direct consumption of phytoplankton by microscopic

organisms called zooplankton, and the filter-feeding molluscs like Mussels that consume vast amounts of diatoms (the commonest type of phytoplankton). Some animals like Periwinkles are grazers of microalgae and seaweeds.

Tertiary production — is the next stage in the food chain where the predatory animals feed on the herbivores. These are the animals that are easiest to satisfy in aquaria because they prey on food that is large enough to be collected. In many cases they will also consume dead food, and the opportunistic feeders in this group of



Small Hermit Crabs are sometimes to be found on the shore in the early months of the year. They feed by scavenging both animal and vegetable matter from rock surfaces using their claws, and also filter feed from the surrounding water, collecting plankton and particles with fine cilia. The species on the left is *Diogenes pugilator* and on the right the commonest species *Pegurus bernhardus*.

PHOTO: ANDY HORTON

aquarist can visit the shore and get a good idea of what feeds on what. He can also collect Mussels, Cockles, Prawns, Shrimps, Mysids and other food items from the intertidal zone to satisfy his captives. Frozen sea food and live Brine Shrimp are also available from the better aquarium retailers. Brine Shrimp and Mysids can be cultured to feed to Pipefishes and young fish

that require exclusively live food. Rotifers can also be cultured for plankton eaters, eg. very young fish, that require this food.

Simplified food chain

Some knowledge of the food

predators are the most successful aquarium fish.

Scavengers

In the cycle of life and death in the oceans, and in aquaria, one large group of organisms fulfil an important role.

These 'heterotrophic' organisms on the microscopic level convert the waste products of fish like the harmful ammonia to less harmful compounds called nitrites. The aerobic Nitrosomonas bacteria fulfil this function in the biological filter bed. These will establish themselves in aquaria with the addition of organic matter.

Large animals are also scavengers and animals like Prawns and Hermit Crabs will feed on dead organic matter, pieces of uneaten food, etc.

Specialist feeders

Many fish and invertebrates have a specialist diet and they can prove difficult to feed. In tropical marine aquaria the problem that some fish eat exclusively coral polyps is well known and is one example of fishes that should not be sold unless the aquarist can provide the fish with its natural diet.

For rockpoolers who catch their own fish he has to find out for himself what they eat. Luckily, many of the rock pool fish will eat anything that is recognisable as food. This may include the aquarist's fingers, but will rarely include 'flake' food that is gobbled up by Goldfish. Research is paramount. There is very little scope for 'cheating'.

Pipefish vacuum up small crustaceans and larvae in their pipe-like mouths. They have been persuaded to recognise frozen Mysids as food, but cannot be relied upon to do so.

Shore collection

There are regulations forbidding collection from certain areas and at certain times of the year which the rockpooler



ABOVE The Grey Sea Slug, *Aeolidia papillosa*, feeding on the Beadlet Anemone *Actinia equina*.

I am interested in all records of Sea Slugs found on the shore or in the shallow sea around Britain. Identification can be tricky, so please do not guess. Reports should include numbers discovered, where found, whether spawn is present and what the Sea Slug is feeding on, as well as anything else of interest. Please address any discoveries to: 'Shorewatch', Glaucus House, 14 Corbyn Crescent, Shoreham-by-Sea, Sussex. BN43 6PQ. EMail: 106127.206@CompuServe.

BELOW Although, it is known that the Dahlia Anemone, *Urticina felina*, can engulf Crabs almost as large as its own bulk, it is not known precisely how this occurs. I would expect a large Crab to be sufficiently resistant to the stinging cells in the tentacles to be able to pull itself free, and this is what happened in the photograph.

PHOTOS: ANDY HORTON



should be aware of. These apply notably to Periwinkles. Mussels are a good staple diet. The trick is to boil them in their shells and scoop out the rich orange flesh. The Mussel flesh can be frozen.

Prawns and Shrimps are best used as live food. It is a common mistake to put too many into the tank as the increased stocking level can cause an oxygen depletion. Limpets can prove too

is harder to spot. Aggressive fish may deprive their shyer inmates of their share of the food on offer.

Good luck and careful fishkeeping.

tough even after boiling, and are best used only in an emergency.

Tropical aquarists should be warned that introducing live food can introduce disease which can ruin the appearance of expensive coral fish. Winkles are the worse example.

How much and how often?

The often used statement that fish should be fed as much as they can eat in a few minutes can be misleading. There is no substitute for knowing your fish and their feeding behaviour. Some predatory fish are 'macrophagous' and will eat relatively few large meals. Others like the Pipefish family, including the sea-horses, are 'microphagous' and require frequent and copious quantities of food at least four times a day, and possibly more often.

It is likely to be more useful for the aquarist to estimate how much of their body weight each fish will consume every day. My observations indicate a figure of wet food between 5 per cent and 10 per cent for adult fish, with greater amounts for growing juveniles.

Compatibility

Watch out, your prize exhibit can easily get eaten by a fish that was smaller when caught, but has grown much more rapidly than its tank companions, which it is stealthily reducing in number.

However, it is relative competitiveness of fish that

The British Marine Life Study Society will help readers who have any difficulties or wish to pursue their interest in the marine life around the British Isles. The first enquiry will be answered free of any charge, but please enclose a SAE.

For more information write to: Andy Horton, British Marine Life Study Society, Glaucus House, 14 Corbyn Crescent, Shoreham-by-Sea, Sussex. BN43 6PQ. EMail: 106127.206@CompuServe. Internet URL= <http://ourworld.compuServe.com/homepages/BMLSS/homepage.htm> (England) Internet URL= <http://www.ed.ac.uk/~evah01/bmlss.htm> for BMLSS (Scotland).

So what does one do on these cold winter evenings? Koi keeping is at a very slow pace, even if you have a heated pond. I have taken to reading Lyn's copy of the Royal Horticultural Society Journal and have found some fascinating articles in them.

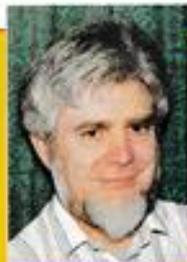
The most recent edition, January 1977, has an article that, because of the strong Japanese element in both our hobby and the gardens that surround our ponds, will be of interest to most Koi keepers us. Titled 'Cold Comfort' and written by Yasutaka Takasaki, it explains, with the aid of some excellent photographs, the Japanese art of plant protection during the cold and often snowbound conditions found in the winters of Japan. The methods of protection used for both trees and plants gives a very attractive look to the garden in these bleak months.

This must have been one of the coldest November/December combinations for some years and it is usually these occurrences that lead to other unusual experiences. We live not far from Warwick Racecourse; an area not particularly wooded but this year we have had several Fieldfare sitting in the oak tree in our front garden eyeing up the Firethorn berries on the wall of the house. It is apparently rare for these birds to come into built up areas! Whilst admiring them gathering in the oak tree over the Christmas holiday another phenomenon occurred. A Heron was observed cruising low over the rear gardens of the houses on the eastern side of my street, turning over my garden at the end and returning along the western side before flying off into the distance. A reconnaissance flight no doubt; I am very glad I have covers over my pond!

A snippet of interest about Herons was noted on the television just before Christmas. They were being blamed for raiding a garden pond until one day a Hedgehog was seen to be swimming in the water with a goldfish in its mouth. The suggestion was that, maybe, Herons are blamed more than they should rightfully be for the disappearance of fish from our ponds! Maybe the 'Anti-Hedgehog device' will be the new Koi product of 1997.

Koi Meetings in February

5 Leicestershire Section
BKKS. Talk on Breeding Koi.



DAVID TWIGG'S KOI CALENDAR

Kirby Muxloe Sports Club.
Contact Mick Reffin, 0116 2712517.

9 Heart Of England Koi Society. Quiz night with Pete and Chris Cornish. Meet near Dunchurch. Contact me on 01926 495213.

12 South Hants Section BKKS. Speaker is Alan Rogers. Meet in Denmead Church Hall. 8pm. Contact George Rooney on 01420 473169.

23 Northern Koi Club. Speaker is Dave Dyson of Cascade. Pond reconstruction. Contact Tony McCann on 0161 794 1958.

Koi Shows in 1997

MAY
3/4 International Koi Show (UK). Luton. Contact DJ's Koi on 01922 493290 or Fax 01922 710191.

10/11 Norwich Section BKKS. 1st Open Show at The Royal Norfolk Showground, Nr. Norwich. Further details contact Glyn Bowman on 01328 851695.

31/1 June. UKol '97. Haydock Park Racecourse, Cheshire.



This high quality 20" Kujaku (above) lost its beautiful deep orange completely over the space of two weeks. The skin quality has remained, the Matsuba scalation improved and this Koi is now a magnificent Suminagashi (right). Will the colour return? Unlikely, but this is still a super talking point Koi!

PHOTOS:
DAVID TWIGG



All Koi keepers are welcomed to the events mentioned in this Calendar (an entry fee may be payable) and further details can be obtained from the contact telephone number quoted alongside the diary entry. My thanks go to all Koi Club Secretaries or PROs and others who send me their latest calendar for inclusion in this column. If your club is not mentioned and you would like it to be, please write to me via the Editor at MJ Publications Ltd, Caxton House, Wellesley Road, Ashford, Kent, TN24 8ET. Although I do my best to ensure all events are mentioned it may be that some information, which arrives a little late, misses my deadline. To minimise the chance of this occurring you may find it more convenient to fax me direct on 01926 403500. This request also applies to dealers with special events, auctions, etc. I look forward to hearing from you.

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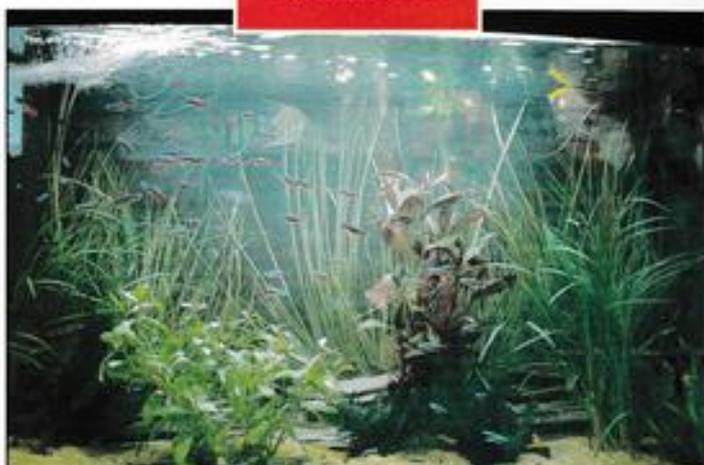
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to refer to conditions of booking.

ALL ABOUT THE TROPICAL AQUARIUM



A nicely aquascaped tank, home to Cardinals, Tetras and Angels.

PHOTO: LINDA LEWIS

It has never been more easy to start fishkeeping with a tropical freshwater aquarium.

Why choose this particular area of fishkeeping? It is generally regarded, despite newcomers' fears over its 'technicalities', as being the easiest when compared with coldwater fishkeeping which, despite its 'pedigree' of hundreds of years in existence, may still be seen as more of a specialist interest, and the obviously more expensive tropical marines.

Thanks to advances in technology, today's modern aquarium is totally reliable and full of innovative features even at the most basic levels. You don't

even have to gather all the pieces together like some DIY kit either as complete, ready-to-go aquariums are available — it really is just a case of 'add water' and off you go!

However, the ease of entry into any new hobby often disguises many early pitfalls which may be encountered by the excited, impatient newcomer. One thing to bear in mind, especially in fishkeeping (no matter in whatever area of interest) there is always the 'knock on' effect to be considered. Everything (and anything) that you do, or put into the aquarium, will affect its

progress or inherent stability to some effect — both for good and bad.

Learning about things in advance has always proved to be the best way to insure against problems. In this Supplement we have gathered together viewpoints on many aspects of starting the tropical aquarium; maybe you won't need to absorb every detail of information provided but nevertheless the practical experiences of those that have 'been there, got the T shirt' will stand you in good stead in the coming months, as you take on one of the best of all hobbies.

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Planning the Tropical Aquarium

DR DAVID FORD, OF AQUARIAN, POINTS YOU ALONG THE ROAD TO
TROPICAL FRESHWATER FISHKEEPING

PHOTOGRAPHS BY THE AUTHOR

Did you know that 53 per cent of UK households include a traditional pet — that means more people own a dog, cat, cage bird or pet fish than do not. Also, in terms of pet numbers, more Goldfish are owned than dogs, cats or birds added together! Of these 53 per cent households almost 15 per cent own pet fish, but most of these are indeed Goldfish, usually in a garden pond — which means the owner sees little of their pet fish. Pond fish hibernate in the winter and the water turns to pea soup in summer. Hence, many aquarists are created by the desire to actually see the fish!

Even if you do not own a pond but would like to own a pet the sensible choice is tropical fish. They are clean,

The tropical aquarium can be much more than a simple glass box.



do not smell or make a mess, are cheap to maintain and can be left (with proper care) if you go away for a while.

A trip to the aquatic shop by the pondkeeper reveals a whole new world of fishkeeping. The choice and beauty of the traditional tropical aquarium is discovered and so the Goldfish remain in the pond and a true Tropical Aquarist is born ...

CHOICES

Once you have decided that a tropical aquarium is for you think carefully about what you want and why ... the choices are much more than just a glass tank with a collection of pretty fishes. They range from a simple unheated bowl of water to a live collection of flora and fauna from the Amazonian jungle.

You can have a living decoration to brighten a dark corner or a fish-house with dozens of tanks for selective breeding of the tropicals. A species tank can



DIY aquariums are possible with silicone sealer, which means any size can be built for that special place — here is the author building a 200 litre tank in his dining room.

include Livebearing fishes (watch the births) or Killifish that lay eggs which can be posted to friends around the World. You can keep the cute Catfishes to watch their antics or the powerful and aggressive Rift Valley Cichlids, who actually show intelligence. A single fish can be a personal pet, such as an Oscar or a Redtailed Catfish (big tanks essential!).

You can join a Club (there are 400 in the UK) and show the fish, even win prizes at local and national fish shows. A few aquarists will visit their favourite fish's natural home and become explorers, conservationists and even discoverers (many aquarists have new species of fish named after them (for example: Aquarian's consultant Dr David Sands, who discovered the fish, *Corydoras davidsandsi*).

Being an aquarist can even turn into a career — there are now National Diploma courses at colleges such as Sparsholt College at Winchester, or Brooksbury College at Melton Mowbray. Several universities have aquatic degrees that include courses on tropical and other fishes and even vets now have a postgraduate course to cover fish diseases (there is a Fish Vet Society).

So, before buying

anything at all, read all about the hobby and the fascination of fishkeeping. Study the choices and decide what is the right one for you. Only then plan the tank (or tanks) and the necessary equipment for the fish you want to keep. You will make a good start by reading this special feature in the *A&P*. Look at the magazine's adverts, too, and send for leaflets or booklets. Browse through a few volumes in the local library or choose books to own from the aquatic store.

THE FIRST AQUARIUM

You have to start somewhere, so let's assume you want to just 'test the water' with a single aquarium. Item one is where it should be sited. There is no point in building a beautiful aquarium in a place where it cannot be seen. The bedroom is not a good choice — most of the time therein you have your eyes closed! The hall is not good either, you do not sit and relax in the hallway.

Place the aquarium in your living (or even dining) room where you really can sit and relax and gaze into the watery world of your new pets. It has been proved

that this lowers blood pressure and reduces heart rates, so it's good for you too. Also, choose a dark corner because the beauty of the tropical aquarium will then dramatically improve the whole room's appearance.

Remember that the true tropical tank will need heating to a constant 24°C (to reproduce the tropics) and it needs an overhead light (12 hours on, 12 off, again just like the tropics) plus a powered filter system and probably an air pump. All these are mains powered so a socket has to be close by and accessible (to turn everything on or off).

Always start with the largest tank you can either afford or fit into the space chosen. The greater the water volume the better it is for the fish's quality of life. Choose at least a 24x12x12in (60x30x30cm), which is 10 gallons (50 litres). This aquarium, with its decorations and fittings, can weigh as much as a grown man (150lb or more) so make sure the floorboards can take the strain. The stand, too, if not a standard aquarium model must be able to take that weight.

The next part of the plan is where to fit the filter ... to maintain essential water quality you must filter the

water continuously. Some filters are designed to be internal so siting is not a problem. The ideal filter is actually one the same size as the tank itself, which is not usually possible. An alternative is to have a large trickle or even fluid-bed filter under the tank, in which case provision must be made for it at the planning stage. The most popular filter is the canister type with a powered pump ... these are not a pretty sight, so again plan where to hide it. If a base cupboard is installed it can be used to house the airpump and even the starters for fluorescent lights.

The traditional rectangle tank is usually placed against the wall — note that you will need space to lift the lid and tuck electric cables and filter pipes behind the aquarium. Hence, do not place it flush with the wall, leave at least a 10cm (4in) gap. (This also means that when you redecorate the room you can paper behind the tank without having to move it!)

THE COSTS

The RSPCA published figures on the average costs of keeping pets last year — the value they placed on keeping a dog for 12 years was over £9,000! Even a cat was over £8,000. This should make fish as pets much more attractive ... although the setting-up costs may be high, the running costs are mere pence per day, or even week.

You can spend as little or as much as you wish on the set-up. By building your own tank (it is easy with silicone sealer), the cost is just cutting and edge-

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polishing scrap glass. If you want a package from the aquatic shop budget for £100-£200. If you want a super, computerised, self-sustaining system, make that £2,000-£3,000!

Often secondhand aquaria appear in the local press at knock-down prices.

What of running costs? To calculate the cost of electricity usage you need to total the number of kilowatts (1,000 watts) used per hour because each kilowatt-hour costs about 7p with the 8 per cent tax (could have been worse!). So examine each piece of electrical equipment, which by EU law has to declare the wattage (W), and total them for each hour's use.

The most popular size of tank is the next size up from the minimal 24in one — the 16 gallon or 70 litre, 3612x12in (90x30x30cm) aquarium. If this is chosen, plus accessories, the running costs will be as follows:

A small airpump would only use 2.5 watts per hour. Filter pumps range from 5 to 20 watts according to their power.

Assuming the largest is used, that is another 20 watts. A 30in fluorescent light is 25 watts but is only on for half a day, averaging 13 watts per hour. The heater/stat is usually 250 watts and may be on continuously or rarely according to the room temperature. If sited in a normal living room the heater will be on less than half the time, say 120 watts per hour.

The total is about 153

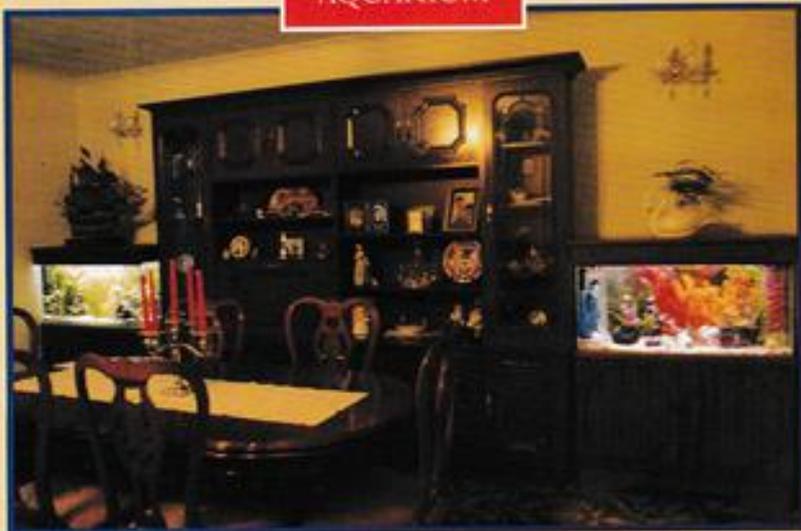
watts every hour. To use 1 kilowatt will take almost seven hours, which, at 7p, is equivalent to a penny an hour. Hence, the aquarium will cost 24p a day, which is nearly £88 a year or £22 on your quarterly electric bill.

Note that this is a maximum. The greatest contribution to the cost is the heater and if the room is generally warm this value can be halved — say £10 a quarter. If you choose a cool-water system with

semi-tropicals such as Blue Acaras, Butterfly Goodeids, Dwarf Cichlids, White Clouds, Paradise Fish, etc, relying on just the house heating, running costs are then only the power filter and lighting, which can be used just for viewing if real plants are not included. This unit will cost less than £5 a quarter. Another cost-cutting idea is to lag the sides and back of a tropical tank with polystyrene ceiling tiles to reduce heat loss.

BE A WISE AQUARIST

Never buy an aquarium on impulse. Never buy a tank and the fish together (the system must be mature before maximum stocking). Once you have decided to join the ranks of aquarists ask, read and study what it is all about before buying anything. You will then get what is best for you — and that will be what is best for the fish. Although fishkeeping is fun it is also a responsibility because, more so than with any other pet, you play God.



ABOVE Aquaria can also be decorative — here are two originally dark coens in the author's dining room.

BELOW One of the aquariums in the picture above with the base cupboard opened to show the trickle and flow filter system used to give essential top quality water to the show tank ... such a system needs planning before building and installing.



Fish Health in a New Aquarium

ROGER FOGGITT OF TETRA LOOKS AT AVOIDING
FUTURE HEALTH PROBLEMS

Once your new aquarium has been set up, filled with water, has been running for a few days to ensure that there are no leaks, and all systems are operating as they should, thoughts then turn to stocking the tank.

However, for the first time aquarist, this is where problems, if they are going to occur, usually do. Not only is he or she baffled by the vast number of species of fish and plants on sale, but the confusion is often made even worse when the aquatic novice is bombarded with such subjects as 'pH', 'ammonia, nitrate and nitrate toxicity', 'water hardness', and many other terms which all relate to what they thought was going to be a relatively simple hobby to get started in. All this technical jargon

is enough to scare even the most qualified scientist off but do not despair though, because, as long as you understand a few basic rules and aspects of fishkeeping then it is nowhere near as difficult and confusing as it may first appear.

Many aquarists say that keeping the actual fish themselves is only a very small part of the hobby because most time and energy is actually devoted to ensuring that the environment in which the fish are living, ie, the water, is kept as healthy as possible.

Keeping the water conditions in the aquarium in perfect health means that the fish will stay healthy and problems are kept to a minimum.

So where do we start in our quest to keep our aquarium fish in perfect health?

Probably the best place for this to happen is at home

with a bit of background reading in a good book on fishkeeping concerning the types of fish that can be kept together. The most important aspect of keeping different species of fish together is whether they are compatible with each other. If they are not then fighting may break out which both stresses and may even kill the fish. Incompatibility does not just occur between species either, it can happen if the same species of fish are kept together so it is important to do some background research before buying your first fish. If you are unsure of which fish to buy then ask your retailer who will guide you in the right direction.

ENVIRONMENTAL CHECKS

So once your choice of fish has been made, before

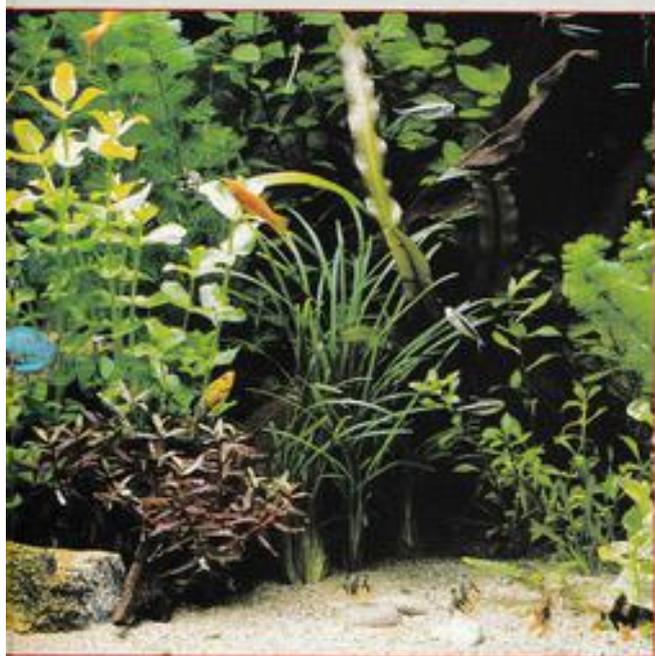


This healthy aquarium is the result of careful planning.

PHOTO: M.P. & C. PEDRO

you rush out and buy them, it is important to ensure that the environment in which you are going to keep the fish is correct for that





species. In other words, are the water conditions in your aquarium suitable for your chosen fish? Again, if the conditions are not compatible with your fish then they may become stressed causing disease or even losses. Probably the best indicator of a match between conditions in your

aquarium and those which the fish are used to, is the pH or acidity/alkalinity of the water. pH is measured on a scale from 1 to 14 with a pH of 1 indicating that the water is highly acidic and a pH of 14 indicating that the water is highly alkaline. A pH of 7.0 indicates that the water is neither acid or

alkaline (more commonly termed as neutral conditions). For the majority of beginners to tropical aquarium fish a pH range of 6.8 to 7.8 is acceptable but there are those fish which prefer acidic conditions (with a pH of roughly 6.0 to 6.9) and those which prefer more alkaline conditions (with a pH of roughly 7.1 to 7.8). Again, this needs to be checked on with your local shop. Although we talk of fish preferring a specific pH value probably the most important aspect of pH is that it remains stable in your aquarium. pH is measured scientifically on a logarithmic scale, that is, for every one point change in pH the conditions (acidity or alkalinity) change by a factor of TEN. As you might imagine a tenfold

or greater change in water conditions is not particularly good for your fish so it is important to ensure that your pH level is maintained. This is most easily done by regular partial water changes being carried out on a weekly or fortnightly basis. It is also important to ensure that the pH of your aquarium water matches that in which the fish are being kept at your local fish stockist. Check on this with your local retailer when you go to buy your fish.

STOCKING THE TANK

Once an aquarium has been set up and the temperature is stable there is often an overwhelming and very dangerous desire to rush out and buy lots of fish to fill up your new aquarium. This, though, is

most certainly the wrong thing to do for the following reasons. An aquarium can in some ways be thought of as a mini-ecosystem and, as with our own ecosystem there has to be a cycling of materials within it, most importantly the recycling of waste products, an accumulation of which would otherwise be harmful. Now I am not talking about the recycling of waste paper, bottles and drinks cans but of materials such as oxygen and carbon dioxide, and in particular harmful wastes such as urea and ammonia.

The 'recycling' of toxic wastes in the aquarium is carried out by purifying bacteria which actually colonise the aquarium filter. As fish swim around in the aquarium water they continuously excrete, mainly from their gills, a very toxic waste product known as ammonia. The build up of the harmful ammonia has to be kept under control and it is converted by the purifying bacteria, to a secondary by-product known as nitrite which is still very toxic although not as toxic as ammonia. This nitrite is then converted, again, by purifying bacteria, to a much less harmful product known as nitrate. This is very much less toxic than both ammonia and nitrite but in high concentrations can lead to health problems. Nitrate is most easily and effectively kept under control through regular partial water changes. Ensure that a water conditioner such as Tetra AquaSafe is used whenever using tapwater to carry out regular partial water changes in order to neutralise harmful chlorine and heavy metals.

This purification process is actually given the grand title of the nitrogen cycle as all the component parts of the system such as ammonia and nitrite contain nitrogen as their main chemical component. However, in a brand new aquarium there are few, if any, purifying



This *Oreochromis* species is hardly an ideal tankmate for the decorative Tetra-filled tank!

PHOTO: M.P. & C. MEDNOIR.

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filter bacteria present in the filter to carry out this 'cleaning' process. If the aquarium is stocked from new with lots of fish the initial build up of waste products is so high that all the fish are poisoned before the filter has become fully 'mature'. Obviously the filter bacteria require fish wastes to feed on and get it going so we do need some fish present in the aquarium initially but the level should not be so high that it causes too high an initial increase in waste levels.

So how many fish do we add to a new aquarium and how do we know when the filter has enough purifying filter bacteria on it to sustain higher numbers of fish?

Well, this is where a bit of mathematics and water testing has to happen.

As a very rough guide to the maximum number of fish that can be kept in an aquarium there is an easy formula to use, which although not actually 100 per cent accurate does serve as a guide to the beginner. This formula is based on the assumption that the holding capacity of the aquarium depends on the surface area of water over which gaseous exchange can occur, in other words the area of the top of the aquarium and states that for every inch (2.5cm) in length of fish (excluding tail fins) we require 12 square inches (75 square cm) of surface area of water.

So, as an example, let us take an aquarium which is 36in (90cm) long, 12in (30cm) deep and 12in (30cm) wide. The effective surface area of the water in the aquarium is, $36 \times 12 = 432$ square inches. Each inch of fish requires 12 square inches of surface area so the maximum holding capacity of this aquarium is; $432 / 12 = 36$ in (90cm) of fish.

This number is the maximum number of fish that the aquarium can hold

and we will use this figure to determine how many fish to start our aquarium with.

'MATURING THE FILTER'

As I have said, if we were to put in our 36in of fish to the aquarium from new there would be a huge build up of wastes due to the fact that the purifying filter bacteria are not present in sufficient numbers to break down that produced by the fish. In order to ensure that (a) there is sufficient food in the water (ie, ammonia) on which the filter bacteria can feed and thus increase their numbers, and (b) that the waste build up is not too large, we must start with a percentage of our maximum stocking level in the aquarium in terms of fish. The method of stocking a tank from new is to add to the aquarium approximately 20 per cent of the maximum length of HARDY fish that the aquarium can hold. In our case 20 per cent of 36 is 7.2in (not numbers of fish remember), so always err on the side of caution and go for the lower value, ie, 7in.

The ammonia and nitrite values are then monitored every one to two days using reliable test kits. What will be observed in these tests is a gradual rise in ammonia level followed by a gradual rise in nitrite level. These values will continue to increase and then begin to drop. Once both levels of ammonia and nitrite reach zero then we can say that there are enough filter bacteria present to convert all the wastes for our SEVEN INCHES of fish. This, though, does not mean that we can now go ahead and immediately stock the aquarium with the remaining 29in of fish to bring ourselves up to our maximum 36in of capacity. Remember that effectively there is only enough food (ammonia) being produced by the fish to feed a population of purifying bacteria sufficient for those seven inches of fish. If we were to add too many fish at this point the bacteria present could not cope with the extra waste until they had replicated to take up the extra 'load'. Too many extra fish at once spells danger so the rule is to never add

more than 40-50 per cent of the current stocking level at any one time. So we can now add an extra 50 per cent of our seven inches of fish to the aquarium, so 50 per cent of seven is three and a half inches. Remember, err on the side of caution and add three inches of fish. The ammonia and nitrite levels are then monitored for a minimum of 14 days and the process of adding 50 per cent of the current load is then repeated. In this way we can ensure that our water quality stays at acceptable levels all the time and the health of our new fish does not suffer. Although this may seem like a long route to getting the aquarium fully stocked, the rule must be slow and steady, too much haste at this stage of the development of a new aquarium may well end up in an upsetting loss of expensive fish stocks.

'INTRODUCING YOUR FISH'

The actual introduction of fish to a new aquarium inevitably leads to the fish becoming stressed.

Unfortunately, there is little that can be done about this, but these stresses can be kept to a minimum by careful fish husbandry. The common method of introducing 'bagged' fish to the aquarium by floating the bag on the surface of the water, and then mixing a bit of water from the aquarium with that in the bag every 5 or 10 minutes and then releasing the fish is now thought to be responsible for some fish losses that have been classed by many, as 'one of those things that happens with fishkeeping'.

The reason for these fish losses is due to the sudden change in conditions inside the bag due to the mixing of 'unknown' quantities of fresh aquarium water with it. Large pH changes can occur suddenly and often

Equalising water temperatures (and qualities) is a necessary step when introducing new fish to the aquarium.

PHOTO: A&P LIBRARY



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temperature changes are also very rapid. This results in stress in the fish and health problems shortly after they are introduced.

The favoured way of acclimatising new fish to the aquarium utilises a rigid container which is strong enough in which to stand the opened fish bag without the contents and occupants being lost. For most small fish bags a 1-2 litre kitchen jug is ideal for the purpose, a piece of standard airline (long enough to reach easily from aquarium to the floor) and a standard airline tap. Once the fish are at their destination the bag is opened and stood upright in the container. The airline is then connected to the airline tap and a siphon is started from aquarium to bag and the flow rate of the water from aquarium into bag adjusted using the airline tap to approximately one drop of water every second.

Once there is approximately twice to three times as much water in the bag as when it was transporting the fish

(preferably without overflowing the bag onto the living room carpet) the siphon can be stopped and the fish moved from bag to aquarium either by hand (wet hands only) or by using a net. Whenever introducing new fish always turn all aquarium lights off for the remainder of the day.

By using this method we ensure that the change in conditions inside the bag is very slow (it may well take in excess of three hours to fill one bag) and thus stress on the fish is reduced, the temperature of the water inside the bag is slowly equalised with that in the aquarium AND by never allowing transport water from the original bag to come into contact with the aquarium, the chances of cross contamination and

infection are reduced.

FISH DISEASE

You may have noticed that so far I have not actually mentioned any actual diseases so far in this article. This is because the maintenance of fish health has to begin with the prevention of the causes of fish stress. In a new aquarium these stresses are more often than not due to transporting and incorrect acclimatisation, poor water quality due to too many fish being introduced at once, the wrong fish being added together and water quality, in terms of pH, etc, not being suitable for the fish.

However, we can all follow the rules but inevitably diseases do occur

and these must be dealt with rapidly to ensure a fast recovery for the fish. In all cases the correct treatment of fish health problems begins with correct diagnosis. Once this has been made then the problem can be rectified. If you suspect that your fish may have a health problem it is recommended that the following procedure is adopted:

- (1) Carry out immediate water testing for pH and raised levels of ammonia and nitrite (and nitrate if you have access to a test kit).
- (2) Diagnose the disease itself, a fish scratching (or flashing) for example may be down to several possible reasons.
- (3) Determine why the problem has occurred (fighting, water quality, etc).
- (4) Treat both disease and rectify the cause of the problem.
- (5) Once the fish have recovered take steps to prevent it reoccurring.

Possible symptoms	Probable cause(s)	Treatment
Cotton wool like growths on body or fins. Mouth region eaten away often covered with cotton wool like growth	Fish Fungus	Proprietary Fungus Aquarium Treatment (tends to be secondary infection so underlying cause must be determined)
Pinhead white spots on body or fins	Whitespot	Proprietary Whitespot Aquarium Treatment
Rubbing or flashing against underwater objects. Slimy coating on skin and fins. Cloudy eyes	External protozoan parasites	Proprietary Whitespot or parasite treatment
Rapid gill movements or gaping at the water surface. Clamped fins. Lethargy	Protozoan parasite gill infection or gill fluke infection or water quality	Proprietary Parasite/Fluke Treatment Check water quality and correct if necessary
Fins eaten away Blood streaked fins Wounds/Abrasions Inflammation at the base of fins Raised scales Protuding eyes	Bacterial infection (Finrot) Bacterial infection Bacterial infection (dropsy) Pop-eye — possible bacterial cause	Proprietary Finrot Aquarium Treatment Proprietary Bacterial Treatment

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AQUARIUM

Setting up a Tropical Aquarium

A tropical aquarium with well established plants, plus Platy.



So you are going to set up an aquarium. You have decided it will be for 'tropicals' and you have an ideal place to locate it. So far so good, as long as you have borne in mind just how heavy an aquarium is once full of water (a 36x12x12in tank will weigh about 13

stones). A sunny spot may at first seem ideal but will make it very hard to control the growth of algae.

The ideal spot would be out of direct sunlight, not too near a radiator, and conveniently close to a power-point.

Now you can collect together the 'ingredients' you need:

LINDA LEWIS GIVES THE RECIPE FOR THE PERFECT AQUARIUM SET-UP

PHOTOGRAPHS BY THE AUTHOR

ALL ABOUT THE TROPICAL AQUARIUM



The ideal growth on the flowerpot shows this tank is well established.

A tank complete with lid and condensation trays or sliding glass top panels.

A strong stand or cabinet to support the tank.

A polystyrene sheet or tiles.

Lots of gravel or sand.

A heater/thermostat unit.

A filtration system.

Decorations and/or plants.

Water.

Lighting, including starter unit if fluorescent lights are required.

Air pump (optional).

Master plug set, or similar.

Timer (optional).

Plants, real or plastic.

You will also need a screwdriver!

There is an obvious item missing from this list — fish.

This is simply because these come a little later. Patience is the first lesson that all fishkeepers have to learn.

Once you have all the necessary equipment, place a thick polystyrene sheet (or tiles) on to the shelf or stand

(cork tiles will also do this job), so that the entire area of the tank's base will be cushioned.

This helps smooth out any minor irregularities which could stress the tank and later lead to cracks. If you want to hide wires behind the tank then sufficient room needs to be left between the tank and the wall.

Now is the time to put any backdrop in position. Painting the rear (outside!) of the tank black or blue also works well. Wipe the inside of the tank with a clean, damp cloth to remove any dust ensuring that no trace of soap or disinfectant is introduced. If you have purchased a secondhand tank and have had to sterilise it before use then it is essential that the tank is rinsed over and over so that no trace of any harmful chemicals remain.

The tank is now put into position and is ready for the substrate. Washing gravel is one of the worst jobs in fishkeeping! Only a few pounds of gravel can be washed at a time so the job seems to take for ever. Early Learning Centres sell sand for children's play pits and this works well in aquaria.

Again it needs washing. The disadvantage is that undergravel filtration cannot be used with it. Once washed place your chosen substrate in the tank to a depth of about 5cm at the rear, sloping down to 2cm at the front. If you decide on undergravel filtration you must put the filter plates and uplifts in before the gravel(?) and the layer of gravel will need to be at least twice as deep if it is to work effectively. Having a slope from back to front encourages uneaten food to gather at the front of the

tank from where it can be more easily removed. It also adds to the sense of perspective within the tank.

Next, it's time for the electrical work. Do-it-Yourself Centres sell things called Master Plugs. These enable four or six individual appliances to be connected to one mains socket. They are easy to use and let you avoid the horrors of complicated wiring, which can be a nightmare, especially when a piece of equipment needs replacing. Labels are supplied which can be attached to each plug to identify which piece of equipment is connected to it.

An air pump will be needed if you use undergravel filtration as it the movement of air and water up the uplift tubes which causes water to trickle down through the gravel and into contact with the

ALL ABOUT THE TROPICAL AQUARIUM

beneficial bacteria that live there (for increased water flow through the system electric powerheads can be substituted). Airpumps can also be used to power various ornaments like plastic divers and treasure chests with lids that open (if you like that sort of thing). Although not essential, airpumps do help to disturb the water surface thereby increasing the surface area available to take up oxygen. A continually-rising curtain of bubbles can also look very attractive.

If you can run to it use a separate socket for the lighting with a timer so that lights are automatically turned on and off at the same time each day. There is a wide range of lighting available that can be used for aquaria, the most common being some kind of fluorescent tube. There are again many different kinds including 'daylight' tubes, ones that give a cold blue light, and special tubes designed for optimum plant growth. In the end, it all comes down to your budget, personal preferences and a little bit of trial and error. Normal tungsten light bulbs can be used but extra care needs to be taken; the lid of the tank must be well-ventilated to allow heat given off by the bulb to escape, and water must be kept away from the bulb and its fitting.

Your choice of filter may also be governed by cost. I began by using undergravel filtration but have since

switched to internal power filters. These come in a range of sizes according to the capacity of the aquarium. They are expensive but well worth the money. Looked after properly these filters can run without problems for years (a range of spare parts are available, too, in case of breakages or losses). Each

type comes with its own instructions for maintenance. More often than not this means disassembling the unit and removing and cleaning the impeller (the part that turns round and moves the water through the unit), and the well in which it sits. I use Cotton Buds. It is a simple job that takes just a few

minutes.

The advice I was given when I bought my first filter was to only clean it every three months but I found that this was not sufficient. I now rinse the sponge (in some water removed from the tank) every fortnight and clean the impeller once a month. When a sponge insert needs replacing I only replace half at a time otherwise the bacterial colony has to build up again from scratch. When I want to set up a new filter I cut the sponge in half and add half taken from an established filter — this means that I can transfer fish much more quickly.

Too costly and bulky for my liking are the external filters but these are very efficient and well worth the additional expenditure if you are setting up a large tank. Filters are a great invention. Used along with frequent partial water changes they ensure that water quality remains high and that fish are healthier (they look better, too!).

Undergravel filters are still popular but can need to be taken with these or they may become

clogged and cease to function properly. Regular 'vacuuming' and gentle raking of the gravel will prevent this although may still need to be stripped down the tank after a few years.

As you intend to keep tropical fish, a heater/thermostat unit will be needed. Nowadays this



Heavily planted community tank, with *Bochi splendens* and *Albino C. aeneus*.

ALL ABOUT THE TROPICAL AQUARIUM

very efficient and reliable and should last for several years without problems. Ideally the heater should be placed vertically in the tank as long as there is sufficient water depth to cover the equipment. Alternatively, the heater can be placed at an angle near the bottom of the tank with the top (thermostat end) raised a little higher than the end containing the heating element. There are also separate thermostats



the risk. There are purpose-made rocks and caves available from pet shops that are safe to use.

I like to include terracotta pots in my tanks. Placed on their sides these offer good cover to those fish that occasionally like to hide. Pots must be clean, and should have been soaked in water for at least a month before they are used. Block the drainage hole with a small pebble or, sooner or later, a fish will manage to get stuck in it!



TOP
A Fluval 2 internal filter.

LEFT
Magnetic scrapers are great for keeping glass clean.

RIGHT
Timers can control lighting automatically.



and heaters available; when using these the two parts need to be placed at opposite ends of the tank to ensure an even water temperature throughout the aquarium.

Now that you have all the equipment in place you can start to think about aquascaping, or making the tank look attractive.

Although it's possible to buy realistic artificial plants, or even run a tank without them, some fish need greenery to nibble on in order to remain healthy.

Plants are also necessary if you want a 'natural' aquarium, as they play a large part in the maintenance of water quality. If you decide on the real thing try to get plants that vary in height. These can be planted in small groups with tall ones at the rear, medium-sized ones at the sides and a few small ones at the front. Don't add Duckweed unless you want to be plagued with it for ever more — it grows at a phenomenal rate and will soon cover the entire water

surface! Whatever you do be sure to leave plenty of open, unplanted water for swimming. A rock or two will provide a surface for algae to grow on which will, again, be appreciated by fish that like vegetable matter in their diet. Choose rocks with care. If they bubble and fizz when vinegar is dripped on to them then they will dissolve albeit ever so slowly and this will affect the pH of the water to the detriment of any fish. If you are not sure about a rock's suitability then don't take

Now it's time to add the water. It's essential to use a conditioner to remove any chemicals such as chlorine. Chemicals may be useful in helping humans keep their teeth but they can damage the delicate gills of a fish. Pour the water over a saucer placed on the tank's bottom to avoid disturbing your carefully arranged gravel and plants!

Once arranged to your liking you can turn on all the equipment — lights, heater and filter — and over the course of the next few

days make any necessary adjustments. If you can add a filter maturation supplement. This promotes the rapid growth of beneficial bacteria.

To start with I would advise setting the heater to operate at 75°F. Then wait a few more days so that the water 'ages' a little then buy a couple of hardy fish. I recommend Guppies for this job. If you have no wish to keep Guppies in the long term then select two males and you won't find yourself overrun!

Fish are usually supplied in a plastic bag. Once home float the bag in the tank for some minutes so that water temperatures will equalise. Then carefully open the bag and, using a small beaker, pour some of the aquarium water gently into the bag. After another few minutes add a little more. You can then gently tip the fish into their new home.

Once you've made that first purchase of fish wait another week. Your family will probably try to pressure you into getting more but try not to give in. Too many new fishkeepers give up at the first attempt because their fish just keep dying. They are victims of 'New Tank Syndrome' — the tank has been stocked with too many fish too quickly that the bacteria needed to convert harmful ammonia and nitrites into less harmful substances have not had the time to build up. The filter, therefore, cannot cope with the fishes' waste products; dangerous levels of ammonia build up and the fish get sick and die. To avoid this misery it is only necessary to be patient and to ignore your friends' jibes!

Test kits are available which you can use to measure the nitrite level in the water. Many good pet shops will test a small sample of aquarium water for you — after all they want you to succeed as a fishkeeper (and future regular customer).

too. When a week has passed and the nitrite level is zero or near enough, or your original Guppies are looking well, then you can add two or three more hardy fish. There are plenty of species to choose from, too many to list here, but you can't go far wrong if you stick to more Guppies, hardy species of *Corydoras* catfish such as *C. paleatus* or almost any of the Tetras. The waste products of these 'pioneer' fish will soon get the bacteria in the filter up and running.

Continue the cycle of waiting, testing and adding a few fish so that you build up the numbers gradually over a period of 10 weeks or so until you reach capacity. To start with it's a good idea to allow at least 25sqcm of water surface area for every 2.5cm length of fish (excluding tail). As you gain experience you'll find that this is a flexible rule but it is a good guide to start with.

This has, of necessity, been a short introduction to setting up a tank. For more information I recommend a visit to your local pet shop. They will either have free leaflets available for your use or will be able to get some for you. There is also a range of inexpensive books called 'Your First Aquarium, Tropical Fish, etc.', published by TFH. The one called 'Your First Aquarium' covers setting up a tank and will set you back just £1.50. A great first book to buy is 'Tropical Aquarium Fishes' by our own Dick Mills; this has loads of information on starting up a tank plus a guide to the range of fish available.

Remember, too, that if you have any problems you are not alone. Everyone has difficulties to start with but there are always people willing to help — either via your local pet shop or local Aquarist Society and, of course, through the pages of *A&P*.

Good luck and enjoy your fishkeeping!



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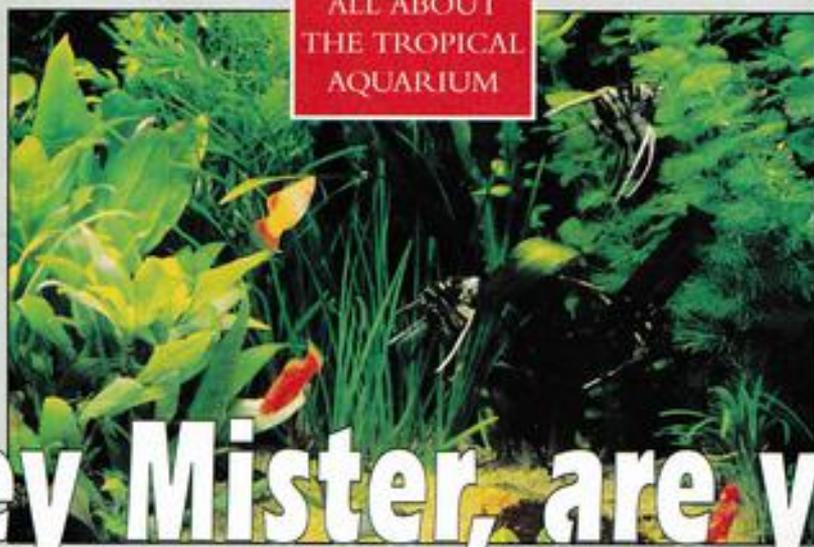
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ALL ABOUT
THE TROPICAL
AQUARIUM



The tropical aquarium is an instant attraction when it's set up like this.

PHOTO:
M.P. & C.
REDNOR

Hey Mister, are you the Fish Expert?

RICHARD FRIEND IS OFTEN APPROACHED BY THOSE WANTING TO START AN AQUARIUM

As I have said before, we have all had it happen. You own an aquarium or perhaps two or more, you spend a lot of time with them, tell everyone how great they are, you have books on the subject and subscribe to *Aquarist* and *Pondkeeper*. So, as far as everyone at your office or factory, street or even village are concerned, you are the local fish nut, the expert to turn to when they, or someone they know, wants to start up an aquarium.

What advice do you give? Often you can think what you should have said some time later. Hopefully, this list of suggestions and ideas will help you point the new convert in the right direction to avoid the pitfalls and discover the pleasures of a very rewarding hobby.

1 READ!

There is a mass of good books on the subject written by people who have enjoyed the delights, and suffered the problems. Reading as much as possible will fuel the fire of ambition to own that aquarium as well as show just how vast and varied a subject this is, and the pleasures that it can bring.

2 WHERE?

The place that you decide to position your prospective aquarium is governed by several factors. First, you want a situation where you are going to be able to relax and enjoy viewing the fish in comfort, for example the lounge rather than the front hall.

The problem is that right next to your favourite chair could be out for other reasons: too much sunlight

shining on the aquarium will cause fluctuating temperatures, and possible algae problems. Taking into account at this stage the fact that you are going to have to change a considerable amount of the aquarium's water on a regular basis will reap dividends later; therefore, ask yourself just how far have you got to lug those heavy buckets of water, and imagine the other half coming home to a trail of soaking wet carpets! A convenient electrical supply is also essential for running all those little extras.

Finally, what is underneath? The weight of a full aquarium can be very considerable indeed, the floor that it is to stand on must be both even and strong enough; if the aquarium is to stand on floorboards then the position of joists must be ascertained and if necessary extra

strengthening provided.

3 SIZE IS IMPORTANT!

Having decided just where you would like to position your new aquarium you are now able to decide on its size. Here is probably the point where most prospective new owners make a crucial mistake.

How often do we hear someone say: 'I only want a little aquarium, I do not want a lot of trouble.'? Well, with little knowledge and little water, trouble is just what they will get. A small aquarium has to be stringently maintained just as much (even more so) than a large one. Water quality can change rapidly in a small aquarium, stocking levels are disappointingly low, extreme care has to be taken with the amount of food

ALL ABOUT THE TROPICAL AQUARIUM

provided, and the small surface area affects oxygen levels.

Having decided that big is beautiful a compromise has to be reached with the amount of space available, and often permission from the other (often quite disinterested) half. The good old 36in by 15in by 12in is usually a good starting point for the beginner. This allows reasonable scope for imagination with the set-up, without too much expense or major problems.

Whichever size you decide on the aquarium will have to stand on something, and the table or sideboard is just not good enough. There are plenty of stands available on the market but, if the price is right, a cabinet type stand is favourable both for practical and cosmetic reasons. The complete set-up becomes a nice piece of furniture, and all those extra pieces of equipment can be hidden away — there is even room for all those books that you will start to collect.

4 WHICH FISH?

There are basically three possibilities to choose from when you come to decide just which sort of tropical fish you would like to keep. These are: tropical freshwater community, freshwater specialist and tropical marine.

The tropical community gives you the opportunity to 'pick and mix' from a vast range of suitable fishes. The choice seems endless, and you can spend many happy hours touring the aquatic retailers discussing and discovering what else can be added. Stocking levels, in terms of numbers, are much higher, you will be able to create your own little ecosystem, and watch all the

dramas of the tropical fish world unfold — feeding, mating, breeding, surviving and, yes, not surviving, as the young of others are hunted down. This set-up is easy to maintain and is a well-trodden path with plenty of help available if required.

The tropical freshwater specialist side of the hobby is just that — a field best left to be progressed into as a specialist with a particular type of fish. However, if good help is available, and this is your aim, there are several fish (of all sizes) that you could keep, such as Killifish, large Catfish, Oscars, or even Piranhas!

The same might be said of tropical marines, these need not be difficult these days, and quite a reasonable set-up can be created for a modest outlay, but running costs are definitely higher if only for the cost of salt mix for water changing. But, again, if you are determined, and have plenty of help, the rewards in colours alone are incredible.

5 EQUIPMENT

There are several pieces of equipment that you just cannot do without when running an aquarium. There are also lots that are just lovely to have — super items to ask for at Christmas or birthdays that satisfy that quest for more to play with in the fishkeeping hobby.

To be quite frank about it, fish swim in their own sewage. Not a very nice way to put it, but it helps to stress just how important a water cleaning system is. In the fishkeeping hobby this is known as a filter system. There are three main types to consider at this stage.

Undergravel, internal canister or external canister. Without going into detailed workings of each, the differences are: the undergravel, which is a perforated plate under the substrate (gravel) with one or two tubes coming from it to the surface, up which the water is drawn. This is achieved either by a flow of air to the bottom discharged through an airstone, or a

small electric pump fitted to the top of the tube, called a powerhead. Both have the effect of causing the water to be circulated down through the gravel (which acts both as a mechanical trapping filter, but, more importantly, as a home for millions of cleansing bacteria), and back up the tubes into the aquarium. There is nothing at all wrong with the good old faithful undergravel method of filtration, a light cleaning with a gravel washer during water changing, and it will serve you well for years; a cheaper and better starter would be hard to find.

However, you do have the internal canister filter available, excellent in performance (most are electrically-powered these days) operated; they are easily cleaned with a bucket of aquarium water, not too expensive to buy, but with one main drawback — they take up valuable tank space and are also more difficult to hide.

Next is the external canister 'power filter': compared with the others, it can now be classed as expensive, really needs to run with the cabinet type of set-up, so that it can be hidden away, but easily accessible. Very efficient, not difficult to maintain, does not take up tank space, this is the one if funds permit. Many often progress to these filters as they get further into the hobby. The size of whichever system you end up with will be that which suits the size of tank that you are to run.

Other equipment necessary, no matter which tropical system you decide on, will be a heater and lighting.

An 'all in one' tube type heater and thermostat is by far the simplest to start with. Thermometers are inexpensive items but help keep a check on water temperatures until you get the knack of knowing the 'feel' of the tank. Lighting is best achieved with



All tropical fish enjoy a meal of live food such as Daphnia.
PHOTO: M.P. & C. PRINCH.

fluorescent tubes, you will get the tube and starter unit complete to suit the size of tank that you have decided on. Deeper tanks may require more light and marine tanks may need even more than the basic lighting equipment provided, especially where invertebrates are to be kept as well as fish.

Air pumps are available to suit your requirements, and can be used to add aeration, run an undergravel filter or maybe provide an entertaining moving ornament in a junior fish tank.

A small net will prove invaluable, as will a syphoning tube (with gravel cleaning attachment for water changes) and a large bucket or two.

6 AFTERCARE

There is a saying in fishkeeping — 'Look after the water, and the fish will

look after themselves.'

Within reason this is a very true statement. Poor water quality is probably the biggest contributor to fish losses. So what makes for poor water quality? There can be several factors.

A quantity of water must be changed on a regular basis, 25 per cent every two to three weeks; this helps to dilute pollutants that build up. To understand the need for this, and relate it to the size of the tank, I usually explain that while you might be content to stay in your locked lounge for two weeks with two or three other people, you would be less keen to stay there with ten or more people before you would be dying, literally, for someone to change some of the air.

Also important at this water change time, is to add a water conditioner — this helps combat some of the less pleasant (for fish) chemicals coming in with your tapwater, not least of

all chlorine.

A common problem that befalls many new fishkeepers is 'new tank syndrome'. The filtration system of an aquarium has two distinct parts whatever type it is: these are the mechanical stage, and the biological stage.

The full description of these is a lengthy process but, in brief, the mechanical stage removes solid waste by trapping it, which you then have to clean out as it becomes overloaded. The biological stage removes unwanted toxic ammonia from the water by progressive bacterial action in the undergravel filter: the ammonia is turned first into nitrite, which is still harmful to fish, then into less harmful nitrate. This process in the new tank creates a peak of nitrite at about six weeks after start up which is when fish start to mysteriously die. Basically low feeding, low fish stocks, and high water changes are

the order of the day during this period.

There are various treatments available if disease strikes. These are best worried about only as, and when, ailments occur.

Finally, overfeeding is a fish-killer, both that which is eaten and that which is not. What goes in must come out, and then be dealt with by filtration. Feed in moderation, your fish will always be looking for food, you will not starve them, but you might overfeed.

Thus you can see that to try to explain to somebody how to think correctly before starting an aquarium, is an involved conversation. Even trying to abbreviate things here is difficult. The best thing is to pick out these main points and expand in more detail as necessary.

This way, hopefully, you will have helped to start them off into what is without doubt a very enjoyable hobby.

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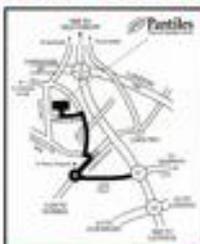
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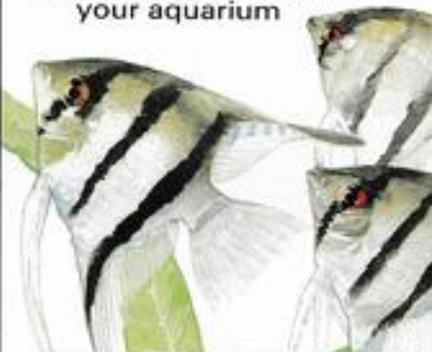
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Rachow's Notho
(*Nothobranchius rachowii*)

The 'Dark Continent' is home to many beautiful and exotic fish and yet relatively few of them grace our tanks today. Part of the reason behind this scarcity is the social unrest which affects much of this area making collecting fish for the aquarium trade both difficult and dangerous. Lake Malawi and Tanganyika are regularly collected but outside this area only a few fish make it into the hobby.

Amongst the African fish which do make it into the aquarium hobby there are some real gems and many of these can be combined in an African community tank. The following are some of my personal favourites:

African Community Aquarium

DEREK LAMBERT CREATES A SPECIFICALLY GEOGRAPHIC AQUARIUM

PHOTOGRAPHS BY THE AUTHOR

Blue-barred Barb — *Barbus barilloides*

is a lovely slender bodied barb with a coppery coloured body with bluey-black vertical stripes along the flanks. It comes from Angola, Zambia, Zaire and Zimbabwe where it is found in slow moving rivers. They prefer to live in a group of their own species but if kept by themselves they team up with other schooling fish and tend to be more outgoing in this situation.

At a maximum size of only 5cm when fully grown they can safely be kept with small fish. Given their lively disposition and general hardiness, however, they can also cope with larger tank mates and lively, fast moving fish as well.

TROPICAL
African Community
Aquarium

Clipper Barb — *Barbus callipterus* is a much plainer species being silvery bodied with black edges to the scales. All the fins are clear except a black flash in the top of the dorsal fin. It comes from flowing rivers and streams in West Africa and likes clean, well oxygenated water. My first experience with this species was about 15 years ago when I bought a pair at my local fish club auction. They proved to be a great asset in my community tank because they were always on the move and looked so happy and alert. At a maximum size of 8cm mine proved to be peaceful with small fish half their own size but equally compatible with other barbs nearly twice their size.

Jae Barb — *Barbus jae* is a relatively new acquisition for me but it is one which I will always try to have in my tanks now. In the wild it is found in slow moving to still waters from southern Cameroon into northern Gabon.

This is another copper coloured fish with a few bluey-black stripes along the sides but with a red flash at the front of the dorsal fin. It grows to only 3.5cm in body length and tends to be a shy, retiring fish which likes heavy plant growth in the tank. They seem to do

much better in a group of six or more when they will spend more of their time out and about in the open water areas of the tank.

Despite coming from very soft, acidic water they can be adjusted to hard and alkaline water providing the change is made over a period of a day or more. Being a very small species, they must be fed small foods to match their mouth size. Mine take any small pieces of flake food they can find and really gorge themselves on newly hatched Brine Shrimp. This live food is

their absolutely favourite and seems to enhance their copper body colour.

Sierra Leone Dwarf Characin — *Ladigeia roloffi* is another of the African miniatures which has a permanent home in my tank. It only grows to 3cm and has a pale yellow body with an orange stripe down the side and orange fins. Its natural distribution is throughout the Ivory Coast, Ghana, Liberia and Sierra Leone where it is found in very soft, acidic waters.

In captivity it can be adjusted to hard, alkaline water but looks its best over a dark substrate in soft, acidic water. Some planted areas help to settle it in a new aquarium but once adjusted it will usually be found out and about looking for food. Despite being such a small fish it still manages to tackle any

food put in the tank.

Rachow's Notho — *Nothobranchius rachowii* comes from Mozambique and South Africa where it occurs in streams which dry up during the dry season. For this reason they bury their eggs in mud and these hatch out with the next rainy season.

Mention Killifish to most aquarists and they immediately think of highly coloured, very delicate, specialist fish. The reality is that many Killifish can be accommodated in community tanks without any problems, providing some live food is fed regularly. Rachow's Notho is a chunky fish with plain, grey females but males of the most beautiful red and blue. In the tail is a distinctive orange crescent and the fins are a mottled blue. At a maximum size of 5cm it can be kept with small to medium sized fish.

I tend to keep one male and a small group of females in a community tank because males can be decidedly aggressive towards each other. Apart from having some plant cover to retire into and regular feeds

BELOW
Sierra Leone Dwarf Characin (*Ladigeia roloffi*).

BOTTOM OF PAGE
Jae Barb (*Barbus jae*).



TROPICAL
African Community
Aquarium

of live food they always seem to do well for me even in hard, alkaline water.

Lyretail Killifish —

Aphyosemion australe is another of the Killifish which can be kept in a community tank. They come from Western Africa and can be found for sale in shops which specialise in the more unusual fish.

Females are a drab brown with a few small red dots in the fins but males have beautifully extended fins with yellow, red and white in them. The body is also covered in red spots and can be either greeny blue, chocolate brown or gold in colour. A wonderful looking fish well worth including in a community.

Although really soft water fish they will adapt to hard, alkaline water and will eat all foods once weaned on to them. To keep them in good health some live foods must be fed and they like places to hide. Males usually adopt a clump of plants as the centre of their territory and stay relatively close to this.

Green Lampeye —
Procatopus aberrans comes from flowing waters in



Lyretail Killifish (*Aphyosemion australe*).

Nigeria and Western Cameroon. It is by far and away my personal favourite African community fish because it has the most glorious blue body and fins with fine red spots in the fins. Males have larger, more pointed fins and are much brighter coloured.

They need a clean, well filtered tank with a good oxygen content but otherwise are not fussy about water conditions or diet. Normally they live in a school which will always be found out in the open at the front of the tank. Breeding males, however, move away from the rest of the group

and select a clump of plants as his breeding territory. From here he will try to entice ripe females over to spawn and will chase any intruding male away. Each ripe female will lay a small cluster of eggs every few days. These are attached to the upper plant fronds and are largely ignored by the male. Once spawning is complete the female swims off to rejoin the school and the male sets about enticing another female.

Upside-down Catfish —
Synodontis nigricentris comes from Zaire and has been only an occasional import in recent times. It is the best of the *Synodontis* for a community tank because it only grows to about 8cm when fully grown and most of the other *Synodontis* grow double this size. It is a mottled dark and light brown on the body and into most of the fins. Take care when handling any *Synodontis* because they have very sharp spines in the dorsal and pectoral fins which can embed themselves in your flesh.

In the aquarium they are

a peaceful fish which like to hide under pieces of bogwood or in caves during the day. At night they come out looking for food. Using their whiskers, they search through the substrate and pick up any leftovers. In a community tank there will be few of these so it is important to drop some tablet food in when you turn the lights out at night and every so often add some mosquito larvae or other live foods to their diet.

When it comes to plants for the African community tank you can do no better than

Vallisneria spiralis

for the back and sides of the aquarium. Foreground species include any of the *Ambulia* genus and for a real splash of colour try to find the Red Tiger Lotus — *Nyphaea lotus rubra*. Although really a water lily it has red aquatic leaves followed by long stemmed, floating leaves. If these are pinched out as soon as the plant starts to send one towards the surface it can be kept with just aquatic leaves for a long time.

One African plant to avoid is *Draena sanderiana* from Cameroon. This has a strong, upright stem about 1cm thick with green and white striped long pointed leaves. I have seen this for sale as an aquatic plant in nearly every aquarium shop I have visited in the last five years and yet it is not an aquatic plant at all. Planted in an aquarium they last about six weeks before they start to rot and pollute the water. If you plant them up in a 4in pot of moist potting compost and leave them on a bright window sill for a few weeks they soon start to grow and make an excellent house plant!

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HI JUNIOR FISHKEEPERS,

It's time for fun again — that is, if you have all shaken off the 'flu that's been going around! I bet most of you hate the thought of getting 'School Reports' (I know I did!), but there is a way where you can get your own back by writing your own School Report — on any aquarium activities at your School.

Of course if your School has an aquarium then everyone there will know how much fun it is and how it's added a new interest, but what would you say to other Schools who haven't got one? How would you persuade them to join the aquarium-keeping world? Is an aquarium easy to keep? How do you organise the maintenance? Why do you think a School should have an aquarium? If you can't manage to draw a picture of your School's aquarium how about getting a teacher to take a picture of it, together with some of the aquarium-keepers — I bet 'Sir' or 'Miss' wouldn't mind seeing their names in print! Don't forget, whenever you write to me please give your name, age, address and say if you belong to a local Fish Club.

The Word Search this month is bigger and harder than usual so it might help pass the time more easily now that the evenings are long and dark.

WORD SEARCH

H	B	S	F	L	O	N	E	S	O	T	Z
S	C	O	T	I	T	E	L	R	L	P	C
I	T	A	G	H	E	A	T	E	R	P	L
F	I	E	D	W	G	R	A	V	E	L	F
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E	Y	C	O	T	L	O	L	T	X	C	O
G	U	P	P	Y	D	W	D	M	L	O	D
N	M	H	S	I	F	T	A	C	Z	I	T
A	L	K	A	L	I	N	E	T	C	A	F
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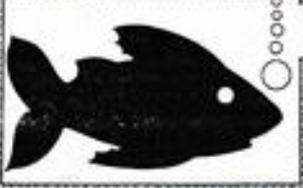
WORDS TO FIND

ACID	FILTER	HEATER	PLECO
ALKALINE	FOOD	LIGHTS	POND
ANGELFISH	GRAVEL	NETS	SHARK
BOGWOOD	GOLDFISH	PEAT	PEAT
CATFISH	GUPPY	PLANTS	WATER



FISH FUN

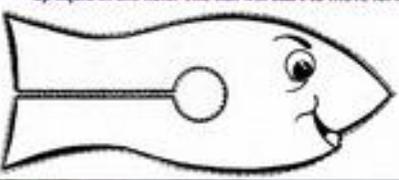
Here are two easy tricks for you to try. You will need some card, glue, a pair of scissors, a clear glass, a jug, a bowl and some washing-up liquid.


1

Cut out the picture of the black fish and hold it about three inches behind a clear glass. Then slowly fill the glass with water from the jug. As the glass fills, the fish will appear to turn round to face the other way.


2

Glue the picture of the white fish to the card, then cut it out using the dotted line as your guide. Don't forget to cut out the hole in the centre. Place the fish flat on the surface of the water in the bowl, then put one drop of washing-up liquid in the hole. The fish will start to move forward.



◀ Pictured
Left
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BREEDING KYBURZ TETRA

PART TWO



LEFT FIGURE 1

BELOW FIGURE 2
Male warning me off as I take photograph.

including the female,
well away from the

eggs (see Figure 2) and even
attacked pieces of plant and

PAUL BARROW
CONCLUDES HIS TWO PART
FOCUS ON THIS CHARACIN

PHOTOGRAPHS BY THE AUTHOR

About 150 clear, amber-coloured eggs resulted from the spawning and these waved about in the current

as if attached to the wood by a fine thread (see Figure 1).

The proud father kept his tankmates,





LEFT FIGURE 3
Male removing debris.

MIDDLE FIGURE 4

BOTTOM FIGURE 5
Free swimming fry (15 days old). The young show a yellow colour. The red eye is caused by the flash.

debris that strayed too close (see Figure 3). All of the eggs looked fertile and showed no signs of fungus. A few hours after spawning I removed the piece of bogwood holding the eggs and placed it in a small tank containing strongly-aerated water from the original breeding tank. About one third of the eggs were lost to fungus before the fry hatched on the third day. The newly-hatched fry remained attached to the wood by the same thread that had anchored the eggs (see Figure 4).

After a few days they lost their mooring thread and hopped and skipped about the wood looking for food. At this point I started to feed them on Liquifry No. 1 and continued to do so until day nine when the fry made their first feeble attempts to swim. By the 11th day, all of the fry were free-swimming like veterans and spent their days pecking at their surroundings (see Figure 5).



Little or no growth took place over this period of time but their body shape did

change from that of a tadpole to that of a true fish. Once they were big enough to hunt down Brine Shrimp they started to grow discernably, and proved to be remarkably hardy with only six fish dying within



TROPICAL Breeding Kyburz Tetra

the first month.

At three weeks of age the young became a very attractive yellow colour, which showed up well against the dark background of the nursery tank. The first of the adult markings, the dark tail spot, showed up during the fifth when the young were about 12mm long. At this stage, the young were transferred to a larger tank to give them more space. This soon became too small because the rapidly-growing fry nipped and jostled each other every time they were fed.

To reduce their numbers groups of individuals were sold on to other aquarists but the remaining fry never seemed to have enough room and by the time they were 25-30mm long only eight could be kept in a 24in tank.

The young fish never showed the same reluctance to feed as their parents, in fact, the opposite was true

and they ate so much that their shape resembled Hatchetfish after feeding!

At four months of age most of the adult colouration and patterning was in place, albeit much darker than the parents. The remaining eight fish were introduced to their parents' tank at this stage. In contrast to their behaviour in the rearing tank they formed a shoal and behaved as any shoaling fish. It seems that the wide open spaces and perceived threat from larger fish modified their behaviour. They mixed freely with the adult female but never strayed into the male's part of the tank. Contrary to the adult's remote behaviour, the young displayed to each other constantly, with lots of

posturing, fin flaring and synchronised swimming.

Having such a large number of fish to compare showed a way of sexing young fish; the tail spots are different between the sexes. Females have slightly smaller, round spots whereas those of the male are square or rectangular. When I checked this with the original pair this held true for them also.

The fate of the eggs and young when left under the care of the father became clear with subsequent spawnings.

From my observations it seems that these Tetras have evolved a primitive parental care system, whereby the male does not guard the eggs or fry specifically but guards an area just big enough to ensure their safety, in this case a tight circle above the spawning site.

However, once the fry hatched out he increased his territory to encompass their movement and the final territorial claim was about one half of the aquarium to protect the fry against predation by other tank inmates. The behaviour cannot be compared to the altruistic form by cichlids who show direct interest in the welfare of the eggs and fry. This type of behaviour is probably an adaptation of territorial behaviour which has evolved and increased species survival rate and does have a significance for the evolutionary biologist because it shows a probable first step taken by truly altruistic egg-guarding species.

A comparison of the young raised artificially and by the father showed that the latter grew at a faster rate but had a far higher mortality rate. I never witnessed predation from

the male, so I presume that any losses were due to the young straying too far and meeting other, less caring, members of the community.

What is the secret of breeding these fish? It seems that the provision of the correct type of spawning site is essential. As with most substrate spawners, Kyburz's Tetra prefers to spawn on a substrate that is similarly-coloured to itself because it provides a measure of camouflage; more importantly, the wood must have a flat sloping surface (20-30° angle seems best) to catch the eggs.

To test this 'sloping surface' theory I removed all such pieces of wood from the parents' tank and the previously prolific pair stopped breeding immediately. Apart from their woody requirements, the other conditions seem to follow the anticipated soft, acid water route taken by most Tetras. A suitable breeding tank would be 60cm long (or longer) complete with plenty of wood and heated to 22°C.

It may take some experimental work to find the correct breeding temperature but by slowly raising and lowering the temperature the fish should be encouraged to spawn.

The more that is learned about the habits of these fish the more interesting they become. Some mysteries still remain: what is the meaning of the strange nuzzling behaviour by the female? Is she polyandrous and leaves more than one male 'holding the baby'? And, finally, what is the purpose of those teeth? Recently, these fish have been showing up for sale in increasing numbers and maybe with this increasing availability someone will be able to solve some of the mysteries which still surround this species.

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FROGS & Friends

By BOB and VAL DAVIES



Hardy Annuals

The savannahs of Southern and Central Africa are home to seven species of small lizard of the genus *Ichnotropis*, commonly referred to as Rough-scaled Lizards because of the spiny, overlapping scales on the back. Although not frequently imported, some Cape Rough-scaled Lizards (*I. copensis*) were in a recent consignment from Mozambique. Like the other species it is a small 6.5-7.5in (16-18cm) lacertid with a wide distribution across Southern Africa — in some areas it may share its range with other *Ichnotropis* species, especially the Common Rough-scaled Lizard (*I. squamulosa*).

Some members of the genus, including *I. copensis*, are referred to as 'annuals' — they mature quickly (seven to eight months), mate and then to die off at the age of 13-14 months or less, having produced one, sometimes two, clutches of eggs — three to nine eggs per clutch.



A recently imported Cape Rough-scaled Lizard — attractive but short-lived.

PHOTO: BOB & VAL DAVIES

In the wild, *I. copensis* mates in October-December, eggs are laid almost immediately and hatch quickly (56-77 days).

I. squamulosa lays eight to 12 eggs in April/May, often in communal sites, which take five to six months to hatch owing to the cool winter weather. Sexual maturity is reached in four to five months. Adults die off around April/May.

As young appear when adults have mainly disappeared there is less competition for food. A third species, *I. grandiceps*, is not thought to be

an annual as adults and young are found at the same time. The remaining species appear to be less well-known and little information is available. The consignment contained both of the two former species. There is some similarity between them but males of *I. copensis* develop a red lateral line. The main distinguishing feature is the frontonasal scale — divided in *I. squamulosa*, undivided in *I. copensis*. In captivity they have thrived in a warm, dry vivarium on the usual insect foods.

What's in a name?

Whilst many people recognise and accept the need for scientific names — they pinpoint exactly which species (sub species) is being referred to which eliminates any confusion when several common names (or even no common name) exist — many people find them confusing and unpronounceable. Dealers' lists can be confusing and frustrating when they carry only common names, eg. Egyptian Garter Snakes — actually *Natrix tessellata* which relates to the Grass Snake — Garter Snakes belong to the genus *Thamnophis*. Fringe-toed Lizards (*Acanthodactylus* sp.) are often

called Wall Lizards (these are in fact *Podocis* and *Loceos* species).

A recent book on Dendrobatid Frogs produced some unusual common names which were new to us: the 'Brilliant-thighed Poison Frog' (*Epipedobates femoralis*) and the 'Lovely Poison Frog' (*Phyllobates lugubris*).

Dendrobates reticulatus, actually named for the reticulated (network) pattern on its rump and rear legs, is referred to as the 'Red-backed Poison Frog'. Several other different species were each in turn referred to as the 'Peruvian Poison Frog'. The 'Dyeing Poison Frog' (*Dendrobates tinctorius*) hardly sounds like a worthwhile purchase!

Even if you learned Latin the pronunciation may vary

according to where it was learned — some names also come from Greek to confuse things even further. To any one with a knowledge of Latin some names are useful: *Hyla arborea* — Tree Frog; *Bufo viridis* — Green Toad. Many geckos are named after the structure of their toes, eg. *Phyllodactylus* = leaf finger; *Cyrtodactylus* = bent finger and so on. Some species are named in honour of eminent naturalists, eg. *Elophis bairdi* — Baird's Rat Snake and other names may have no meaning, they are simply made up as in *Corucia* — Prehensile-tailed Skink.

Scientific names are often revised as a result of further study — these changes are not always universally accepted and can be the subject of heated arguments.

Evolution

The study of evolution must be at times extremely tantalising. Gaps in the fossil record often prevent the formation of a complete picture of the development of various present-day species. Modern frogs with their short body, muscular jumping legs and lack of tail have been around some 190 million years according to a recent discovery of the oldest fossil of a true frog which once lived in Arizona and reported in 'New Scientist'.

It has been given the name *Prosalinus bitis*. Its skeletal structure differs little from that of existing frogs.

About 235 million years ago a creature named *Triadobatrachus*

Amphibian set-ups

Newts and Salamanders have fairly simple requirements: adequate moisture and sufficient hiding places. The substrate can be soil-based potting compost covered with moss and pieces of bark for hiding places. Peat and peat-based composts are best avoided because of their acidity. The medium will have to be changed regularly so simplicity is the keynote. Since most Newts and Salamanders need cool conditions native plants such as Moneywort or small Ferns which like moisture can be used if required. If a water section is needed then plants such as *Elodea densa* and *Hydrophila polysperma* can be supplied for egg-laying. However, these are more suited to tropical aquaria and will not survive the winter. The occupants must be able to climb out of the water if necessary — a stone or sloping piece of slate can be provided for this purpose.

If desired Newts can be transferred in Spring to an aquatic set-up and returned to their terrestrial quarters after breeding. Where a permanent water section is present some live foods will drown and must be removed to prevent pollution.

Keeping small frogs gives more scope for decoration. Large frogs can wreck a planted vivarium unless the plants are exceptionally sturdy but sturdy plants tend to need a large vivarium. Also many large frogs burrow and produce copious amounts of waste so the set-up cannot be too elaborate. For smaller frogs it is possible to set up a sustainable system which, if not over-populated, can last for years. Large pea gravel forms the bottom layer on top of which is placed a layer of activated charcoal. Over this soil-based potting compost, followed by medium gravel with a covering of moss complete the final layers. Plants should be put in place before the final gravel and moss layers. This forms the basis of a 'balanced' system similar to that which aquarists will be familiar with.



A set-up for small frogs, in this case Arrow-poison Frogs (*Dendrobates*), using a 'balanced system', can be attractive and last for years if not overcrowded. PHOTO: BOB & VAL DAVIES

Solomon Island Boas

Having obtained a pair of *Conopsis carinata* a few years ago we started looking for breeding accounts. Information was sketchy but it seemed the main problem was inducing the young to feed. According to available literature *C. carinata* can produce large litters, possibly more than 60, of very small babies. The neonates have a peculiar habit of curling up tight like a Royal/Ball Python or going rigid in an outstretched position whenever they are disturbed. Because of this behaviour, and their tiny size, attempts at force-feeding using a pinky pump were reported to be unsuccessful even causing the babies to die.

Last year we were presented with a litter of 11 babies measuring between 8 and 9in (20-22cm).

They were housed in small, ventilated containers each with a small branch and persuaded to eat thawed pink mice by scenting the food using infertile lizard eggs. Some fed but others needed the food scenting with a thawed-out day old chick. Eventually food was accepted without scenting.



Conopsis carinata neonates often adopt and maintain a rigid or 'ball' position when picked up. PHOTO: BOB & VAL DAVIES

mosineti lived in Madagascar — its head was frog-like but it had a longer body and several vertebrae which formed a short tail — this creature is thought

to be the ancestor of the frogs and toads. At some point the vertebrae in the tail disappeared leaving one single bone, the urostyle, and the sacral ribs

became positioned differently to most other land vertebrates to allow flexibility when jumping. To complete the record fossils which are

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intermediate between the two forms are still needed.

A changing world

Early in 1996 a workshop was held in Oregon, USA, to discuss atmospheric and climatic changes and their possible effects on wildlife (in particular anurans). They forecast that from present patterns the world will become cloudier with lower temperatures at high altitudes. A wetter atmosphere and higher temperatures in the mornings rather than afternoons were also predicted. Increasing temperatures will produce longer dry seasons and decreased soil moisture.

All these factors are expected to cause changes in vegetation patterns and therefore the ability of various animals to exist in many of their present habitats. Some animals may be able to move but species (especially frogs and toads), which are ecologically and geographically restricted, will be particularly vulnerable to such changes especially the possible drying out of many areas.

CLAMS

C LASS: BIVALVIA
With over 15,000 different species of bivalve mollusc known to science, the mariner might reasonably have expected that a wide and varied selection would be available to the aquarium trade.

Unfortunately, this is not the case. Granted, a fair proportion are not to be



particles are short supply. It is this very algae that provides the mantle with its own distinctive colouration and patterning, making the clam so attractive.

Most clams possess a wide range of colours that leave many other invertebrates looking drab. Blue, green, brown, grey, orange, yellow, gold, purple and red are all to be found, with some colours more predominant than others.

(and other bivalves)

found in the tropical oceans, but of those that are, some of the names will be quite familiar (if only for culinary reasons!), such as clams, oysters, mussels, cockles and scallops.

Bivalve molluscs are so called because each species possesses an inhalant and exhalant syphon arrangement by which the animal draws in water, filters it for food particles and then expels it. Having said that, some species make no clear distinction between syphons which may be fused together. Other common physical characteristics include a pair of symmetrical, hinged shells,

TOP OF PAGE
Tidiana creta.

NICK DAKIN CONTINUES HIS SERIES ON NON-FISH MARINE LIFE WITH SOME SHELL-DWELLERS

PHOTOGRAPHS BY THE AUTHOR

held together by two powerful muscles, known as the adductor muscles.

CLAMS

Clams are an ideal example of the bivalve mollusc and are familiar to practically everyone. They do not possess a head in the accepted sense of the word but there is a pair of large gills which allow the animal to breathe, whilst also acting as a food filter. These gills can often be seen through the large slitted opening —

the inhalant syphon — in the fleshy mantle. Water is drawn in through this opening, passed over the gills and any food particles are trapped on a sticky mucus layer. Once trapped, tiny beating cilia transfer the food to the mouth and the treated water is passed out through the smaller exhalant syphon. However, this feeding strategy is not the only one adopted by the clam. The fleshy mantle is home to symbiotic algae known as *zooxanthellae* and can provide vital nutrients where suspended food

It is often misunderstood that colouration and, to some extent, patterning alone are a reliable indication of species, but positive identification is not quite that simple. Scientists tell us that the only dependable method of classification lay in the study of the shells (preferably after the flesh of the animal has been cleared away).

Fortunately, certain identification is of little consequence to the marine aquarist, for it is the combination of colour and pattern that hold the appeal, rather than the scientific nomenclature.

Clams and other bivalves often find themselves in areas of strong water movement and consequently have devised several methods to prevent being

swept away in the current. Foremost is a gland situated at the base of the animal which produces extremely strong elastic fibres that can attach to any permanent substrate, eg. rocks, etc. The gland is called the byssus gland and naturally enough the threads emanating from it are known as byssus threads. Biologists know the whole 'root-like' configuration simply as the byssus.

Byssus threads are often to be seen trailing from a newly removed clam and can prove a dangerous source of infection if the animal is not detached properly. A sharp razor blade or scalpel must be used to cut the threads cleanly at the point of attachment, not close to the flesh of the animal. Merely pulling the clam away can cause irreparable damage to delicate tissues and must be avoided if long term success is to be achieved.

In common with other bivalves clams also have the ability to extend a large powerful muscle known as a 'foot'.

While many other species use this device to move about or burrow deeply into the substrate, clams prefer to reserve its use for movement

or temporary attachment, rather than for any burrowing activity.

THE HOLLYWOOD MYTH

It has long been a favourite ploy of Hollywood directors to depict giant clams trapping a diver's foot within its grasp. These scenes have led many to believe that clams are dangerous, even predatory creatures. Like most things that come from Tinsel-Town, facts were never allowed to get in the way of a good story! In reality, there are a few (but only a few) grains of truth that fuel this myth and warrants further attention. The mantle is edged with light receptors, seen as small black dots and these react to passing shadows or nearby movement, causing mainly younger specimens to swiftly withdraw their mantles and close their shells tightly together.

Clam flesh would make a very acceptable meal for many predators and such protective measures makes it almost impossible for most hunters to gain access. Having said that, the shells of the Giant Clam (*Tridacna*

gigas) — the Hollywood stars — which may grow to over 1m in length, are nearly always fused to adjacent rocks and incapable of closing fully, or with any speed for that matter! Clams such as this are often very old and the mantle is tough and unappetising, even to the hungriest of prospective diners, so the importance of closing the shells fully becomes less imperative with age. Therefore, the likelihood of any diver being held by a giant clam is remote to say the very least!

REPRODUCTION

A few bivalves are hermaphroditic but the vast majority, and all clams, have separate sexes. Although males and females are not easily identified, except at spawning times, this knowledge is useful to semi-wild farms which breed bivalve specimens for both the aquarium and food trades. The importance of such farming cannot be underestimated as the food trade in these creatures accounts for billions of dollars every year and wild collection could not sustain such a massive demand. It has to be stressed here that the aquarium trade accounts

for a minute proportion of this trade by comparison.

If it were not for a difficult larval stage, requiring specialised rearing techniques, the marine aquarist could possibly raise clams and other bivalves within the aquarium; so far, sadly, this has proved almost impossible to replicate.

POSITIONING AND GROWTH

Owing to the symbiotic algae within the mantle, moderate to intense illumination is necessary. A high position on the rockwork to bring the clam closer to a light source is quite acceptable, although the location should be secure to prevent toppling and likely damage to itself and other corals. Careful consideration must be given to positioning as clams attach themselves with the byssus very quickly and will be difficult to relocate after a few days. Strangely enough, the proximity of stinging hard corals and anemones seems to have little effect but all the same, enough space must be allowed between species.

Given optimum conditions growth is slow but steady. The process might be assisted by the maintenance of high water quality, elevated levels of calcium to aid shell growth (440-450ppm) and intense lighting by metal halides. Fortunately, clams are very long lived and resistant to temporary dips in water quality, making them ideal candidates for reef-keepers at practically all levels of experience.

HEALTH

As a rule, clams suffer from two main health problems, both of which are easily avoided by the conscientious mariner.



Giant Clam (tank bred)

MARINE Clams and Other Bivalves

Firstly, poor environmental conditions (mainly water) or bad handling (constant relocation), causes the adductor muscles holding the two halves of the shell together to degenerate. As a result, they detach and the clam begins to 'gape'. Deterioration is usually very quick and the dying animal must be removed to prevent wide-scale pollution.

Secondly, Bristleworms have a tendency to invade the creature by way of the siphons and begin to devour them from within! Consequently, regular removal of Bristleworms using proprietary traps must be carried out in tanks where clams are housed.

When choosing a clam, make sure that the mantle is fully extended and as colourful as possible. Pale, insipid specimens are best avoided. Inspect the base of the animal and discard those where the shells are not permanently joined, or where the area around the byssus is swollen or protruding masses of threads (indicating frequent relocation). The clam should shut vigorously in response to nearby movement such as a hand shadow passing over it. A sluggish or non-response to such actions could indicate problems in the nervous system.

FEEDING

Most clams require very little in the way of particulate feeding where the lighting is sufficient. Indeed, the addition of liquid foods may pollute the water very quickly. Where fish are maintained and fed in the same aquarium, the small amount of juices from frozen foods can prove very beneficial to the clams which provide a useful service to the system as a whole by

removing this unwanted load on the filters.

SPECIES AVAILABLE

Three main species falling into the genus *Tridacna* form the bulk of clams commonly available to the aquarium trade. The most frequently seen is the cultured *T. gigas*, with *T. ovata* and *T. mazima* making a welcome and generally more colourful showing from time to time.

OTHER BIVALVES

A small selection of alternative bivalves are available to the mariner from time to time. These include: The Flame Scallop (*Lima scabra*), The Caribbean Spiny Oyster (*Spondylus americanus*) and Green Mussels (*Mytilus* sp.?).

It is rather unfortunate that these interesting and sometimes highly colourful animals cannot be recommended to the marine aquarist with the same enthusiasm as clams. There are two main reasons for this: (1) None of the bivalves mentioned possess symbiotic algae within their tissues and, therefore, rely

entirely upon filter feeding for nutritional purposes. Sadly, marine aquaria are devoid of the constant supply of suspended food particles required, being so efficiently (and necessarily) removed by the filtration system; (2) Predation from other tank inhabitants is commonplace. Fish, Crabs, Lobsters, Shrimps and Bristleworms all find their flesh very appealing and owing to the confines of the aquarium, persistence generally pays off, as the bivalves cannot escape unwanted attention as they would do in the wild.

FLAME SCALLOPS

(*Lima scabra*) The intensely red colouration of the flesh and protruding tentacles make these bivalves a popular choice for the invertebrate aquarium. They are quite adept at swimming, albeit rather ungainly, and generally retire to the dark recesses of the aquarium rockwork where they cannot be admired!

Marinists wishing to maintain this species for long periods are advised to feed twice daily with live rotifers and/or Brine Shrimp

nauplii. The filtration and pumps must be temporarily switched off while the food is squirted in the vicinity of the animal. Failure to feed properly will eventually lead to death and the possibility of resultant critical pollution.

CARIBBEAN SPINY OYSTERS (*Spondylus americanus*)

These and other *Spondylus* spp. behave in much the same way as Flame Scallops but tend not to be so attractive. Their feeding requirements are identical and should not be considered for an aquarium housing potential predators.

GREEN MUSSELS (*Mytilus* sp.?)

Green mussels are often purchased in clumps of several indescent individuals, all firmly attached to each other by means of their byssus threads. Strangely enough, this behaviour does not last long in the aquarium with the colony tending to disperse quite rapidly. Each individual mussel can travel some distance, continually throwing out byssus threads and pulling themselves along until a favoured spot is found. Here, unless sufficient food is available, it will quickly starve to death! Mussels are heavy feeders and require the same attention as scallops and oysters.

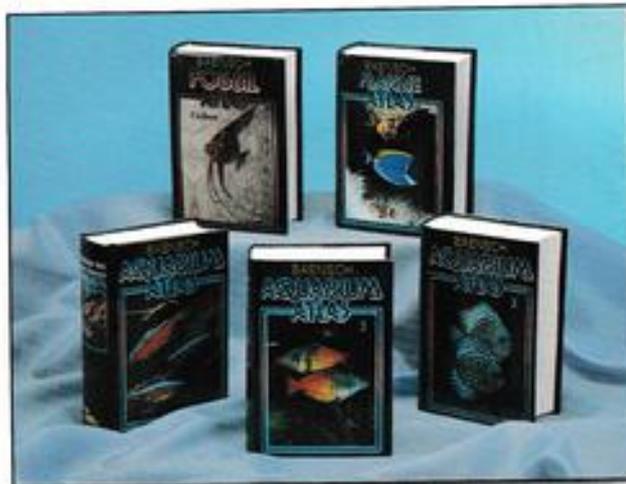
Note: Whilst Mussels are generally difficult to positively identify (and as can be seen, there still remains some uncertainty where Green Mussels are concerned), it is interesting, if not a little disturbing, to see that importers and some retailers are continually insisting that they be some sort of *Lepas* spp. Perhaps they have yet to notice that the genus *Lepas* are in fact crustaceans and not molluscs! There is quite a distinction that even most newcomers would appreciate!



Flame Scallop (*Lima scabra*).

New book, tank and aquarium care

Fishkeepers are notoriously thirsty (for aquatic information!) and snap up any new publication with zest. A case in point is the Baensch series of Aquarium Atlases released by Rolf C. Hagen. Although the important practical information contained in these volumes is 'universal' in any language (colour photo, scientific name, size of fish, temperature range, water hardness and pH, etc) and, therefore, each of the original German editions is of value to non-German readers, it is something of an occasion when



The range of Baensch Aquarium Atlases from Rolf C. Hagen.

the 'English version' is released. The latest 'Baensch' (No 3) continues the freshwater following of Volumes 1 and 2; in addition to the expected Families and genera, there are exciting additions now coming out of Russia which, should, eventually impinge on the coldwater side of the hobby. Also in 'No 3' (which contains descriptions of 900 fish species) are some 80 species of aquatic plants suitable for the aquarium. Roll on No 4!

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BARRY JAMES' round-up of the latest innovations for your pond and aquarium

Fluorescent Aquarium ornaments. The Vibrascapers are plastic Aquarium Plants (scrub-cleansable, too) and their 'Dayglo' trendy colours will light up any aquarium as will the bizarre collection of archways, rocks, caves, barrels, cars, bridges, skulls and a model diver. Just imagine what these will look like under suitably powerful colour-enhancing lamps!

On a more serious side the Total Care range keeps your aquarium conditions well within the bounds of sensibility.

FinCare-Aqua Plus with PHE Water Conditioner makes municipal water supplies safe for aquarium use whilst the PHE (Pure Herbal Extract) essential

chemical and biological filtration.

TRONIC heater/thermostat featuring patented thermal sensor, temperature dial setting and automatic safety shut-off when removed from water.

SUN-GLO fluorescent tube incorporated into hinged, self-supporting hood.

One-piece moulding means no seams to leak or spoil the sleek lines, 10 gallon (US) capacity.

One plug runs all electrical items.

If you find the current weather conditions dull and uninteresting you can make sure it doesn't spread to your aquarium by brightening it up with Vibrascapers and

oils reduce stress during transportation and acclimatisation of fish, coating the scales and fins to protect against scrapes, cuts and many parasites.

BioCare-Waste Control, Organic Waste Eliminator is a powerful mixing of beneficial cleaning bacteria to break down sludge and use using algae-feeding nutrients. Used in conjunction with Cycle Biological Filter Supplement it provides all the biochemical stability of a natural water system.

FloraCare-Plant Gro, fertiliser for freshwater plants is a non-toxic, liquid plant supplement which replenishes all elements exhausted by plants in a closed system such as an aquarium.

Details from: Rolf C. Hagen, California Drive, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH. Tel: 01977 556622. Fax: 01977 513465.

Heron deterrent, junction box and submersible cable connectors

Two cupfuls of water, two PP3 batteries and your Heron problems are gone! That's the promise made for the new

The Total Care range of aquarium products from Rolf C. Hagen.





The Cypri-Guard Heron Deterrent from Cyprio.

CYPRIO-GUARD Heron Deterrent. The idea is simple: an infra-red scanned area is set up by the pond and any intruder triggers off a noisy jet of water over itself as it approaches.

Obviously the two batteries power the unit and although the unit is connected via a garden hose to the domestic water supply it only uses two cupfuls of water per activation so summer sprinkler bans won't apply. The device is fully-adjustable for sensitivity, distance and direction and will detect intruders at a distance of up to 10m in a wide forward facing arc.

Extreme care should be taken with all electrical connections and even more so when there's water around. With more and more 'appliances' being available for the pond (pump, UVC, lights, etc) a safe control box has never been more important. The new Junction Box from Cyprio has a tough, weatherproof housing with two high quality on/off rocker switches and a neon 'on' display indicator under a flexible translucent cover; an easily accessible 5 amp fuse protects the domestic supply from overload. It can be mounted, courtesy of the backplate on a post, wall or in the dry chamber of your filtration system and in conjunction with a 30mA RCCB (residual current circuit-breaker) forms a truly safe way to manage electrics around the pond. Additionally, the new Submersible Cable Connector will not compromise safety of pondkeeper or fish. It has a special locking collar with automatic latch and sealable cable glands but is easy to take apart to gain access to the terminal blocks inside.

Details of all products from: Cyprio Ltd, Hards Road, Frognoll, Peterborough PE6 8RR. Tel: 01778 344502. Fax: 01778 348093.

Weekend and holiday blocks and heaters

Planning a holiday this year? Don't worry about your fish being neglected for Interpet have come up with Weekend and Holiday Food Blocks to keep your fish contented whilst you're away. The Food Blocks simply progressively dissolve away in the aquarium releasing freeze-dried solid food for the fish such as Tubifex, Daphnia, brine Shrimp and Mosquito Larvae — all natural food for both tropical and coldwater fishes. The Weekend Block is sufficient for the average 10 gallon aquarium and lasts 2-3 days whilst the Holiday Block lasts up to two weeks.

All you require from an aquarium heater is that it's safe, accurate and easy to use! You could well be describing the new Tropi-Therm range of heater/thermostats which deliver the required temperature to within +/- 0.5°C. Five sizes are available to suit aquariums from 18in to 48in (23-270 litres) manufactured to British Safety Standards and double-insulated for safety, the design features an on/off indicator light, easy-to-adjust temperature control and strong effective suckers to keep the heater in position. Their sophisticated design ensures the heaters are discreet in use — you'll need to look hard to spot them in your tank.

Details from Interpet Ltd, Vincent Lane, Dorking, Surrey RH4 3YX. Tel: 01306 881033. Fax: 01306 885009.

Interpet's Weekend and Holiday Food Blocks keep your fish contented while you are away.

Keep taking the tablets

With a name like TABIMIN who else would you feed it to but a catfish? If you know your catfish then you'll appreciate that another well-known member of the 'cat' family, the Plecostomus, is also catered for with PLECOMIN. Then there's TETRA TIPS, yet another treat food for fishes.

All these foods are compressed into tablet form which means they can be pressed against the inside glass of the aquarium at precisely the right place for certain species of fish to feed upon. If you want to vary the presentation there's no harm in simply breaking them up into pieces and fed whole to larger fish.

Each food comprises different 'recipes': TabiMin contains all the balanced goodness of TetraMin Flake; Tetra Tips is based on freeze-dried Shrimps, Bloodworm larvae and Tubifex Worms; PlectoMin is vegetable enriched and its spirulina algae content helps to enhance natural colours.

Details from: Tetra Information Centre, Lambert Court, Chestnut Avenue, Eastleigh, Hampshire SO5 3ZQ. Tel: 01703 620500.

Ceramic filter media and corals

Readers of the advertisement pages in A&P may, like me, have wondered about the names of some products. ALFAGROG may well sound like a dubious liquid refreshment for landlocked sailors but in fact it is the name of a range of porous ceramic filter materials whose very high

surface area makes it an ideal site for colonising nitrifying bacteria. It is widely used in farming saltwater fish commercially. It is available in various 'grain sizes' and colours where the combination of substrate and rockwork uses makes impressive visual impact along with excellent practical hideaways for the fish.

ALFACORAL is manufactured in a similar manner to Alflagrog but is expanded to a greater degree to produce larger pieces which resemble coral, having a multitude of differently-shaped (and sized) cavities. Being inert it will not alter the pH of the water and can be used in both freshwater and marine aquaria; its porosity and very light weight means it displaces very little water.

Details from: Alfa Aggregates Ltd, 10 Water Street, Newcastle, Staffordshire ST5 1HP. Tel: 01782 711155. Fax: 01782 712510.

Now here's a good read

If your New Year's Resolutions included 'Must buy a new book' then you'll have quite a job sorting out just what to buy from TFH's large list of new titles. Fortunately, prices range from 'pocket-money' proportions upwards so there's lots of opportunities to get just the right book for either your shelf or pocket!

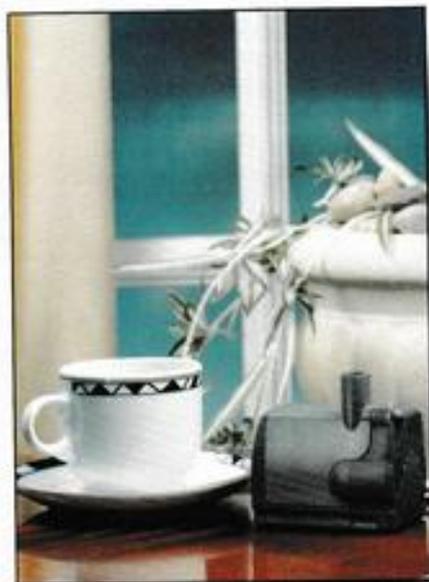
A feature of the 'Your First ...' series is found in very small print on the Contents page — they're printed in England! Looking further they also contain photo materials by some very well-known names to A&P readers but this is not just the only good reason to see them. In the first three titles of these modest 32 page booklets you can find guidance on Goldfish, Tropical



Fish and Aquariums; other non-aquatic titles include Finch, Cockatiel, Kitten and African Land Snails. For its size each contains a wealth of basic and simply presented practical information for the aquatic newcomer.

Moving up the scale to the larger RE series the titles in this 64 page range of booklets include Goldfish, Tropical Fish, Catfish, Platies, Discus, Guppies, Siamese Fighting Fish and Piranhas. Each title is sub-titled 'Keeping and Breeding Them in Captivity' and, of course, each subject is dealt with in more depth (sorry! no pun intended) than in the previous series.

Of course what we all want can be summed up in the next title 'How to Have a Successful Aquarium' by Dr Stephen Dreyer



No bigger than a teacup, Hozelock's new Micro 450 Pump creates quite a stir in small water features.

and Dr Rainer Keppler. A special point of this title is how the two authors have not only included what you should know and do to fulfil your aquatic dreams but also they have also shown how much fun you can get out of fishkeeping, too. Coming in at 160 pages you can see there is plenty of room for both approaches to the subject — no wonder the authors are self-confessed sufferers from 'Aquarium Fever'!

How many times have you

BUY LINES

BARRY JAMES' round-up of the latest innovations for your pond and aquarium

heard aquariums described as living pictures! Connecting pictures with art is but a short step to take but an amalgamation of all three is only achieved on rare occasions — or so we thought, until we saw the first of Takashi Amano's Nature Aquarium World books. Not only does

the author explain the reasons and rationale behind what he does and also the techniques involved but also captures in photography the most exquisite aquascapes of the finished works. In Nature Aquarium Books 2 and 3 the sequels to the original describe specific aquatic landscapes made in aquariums of under and over 50 gallons in size. Details of the equipment supporting the aquariums are also given but you have to tear yourself away from the pictures first!

Dr John E Randall's book Caribbean Reef Fishes deservedly became a classic when it was first published. Now with the third, revised and

enlarged edition the marine fishkeeper can expand his underwater horizons to find information on 326 species most likely to be encountered near the shore within the area bounded by Southern Florida, the Bahamas and ... Brazil. Mention is also made of some 100 other species usually with enough information to permit positive identification. It's enough to make one reach for the scuba gear and book an airline seat.

Finally, reflecting the subject matters contained within the pages of A&P, herpetologists aren't neglected in the TFH line-up. Among the most recent releases, also in the modestly-priced RE series, are Rattlesnakes, Gray-Banded Kingsnakes and Uromastix and Butterfly Agamids all by Jerry G. Walls, and Desert Snakes and Green Snakes both by W. P. Mara.

Details of all TFH books can be obtained from: TFH Publications, The Spinney, Parklands, Forest Road, Denmead, Waterlooville, Hampshire PO7 6AR. Tel: 01705 268122. Fax: 01705 268801.

Small pumps and big support

Hazelock have released the MICRO 450 pump, no larger than a tea-cup, which will turn over 450 litres per hour with a maximum head of 1m — ideal for indoor water features whether floor-standing, wall-mounted or of table-top design. The pump has been purposely developed by Hozelock specifically for use with small

indoor water features, and incorporates a flow adjuster and a front inlet to prevent sediment being drawn into the unit.

Hozelock Aquatics' marketing manager Richard Bradley envisages a great demand for the Micro 450.

"There is a growing market for small indoor water features, and we believe that this unit is the first which has been designed specifically to suit this purpose. The small size of the unit and its ability to adjust the flow-rate from 450 litres an hour down to nothing mean that the pump can be used for a wide range of applications, from conservatory and indoor water features to moving water ornaments."

The 'Hozelock Information Centre' — a comprehensive set of eight information leaflets is available free of charge; each is devoted to a specific area of water gardening:

1. Create a Garden Pond
2. Pond Pumps
3. Pond Liners
4. Pond Filters
5. Pond Lighting
6. Garden Lighting
7. Accessories
8. Fish Care

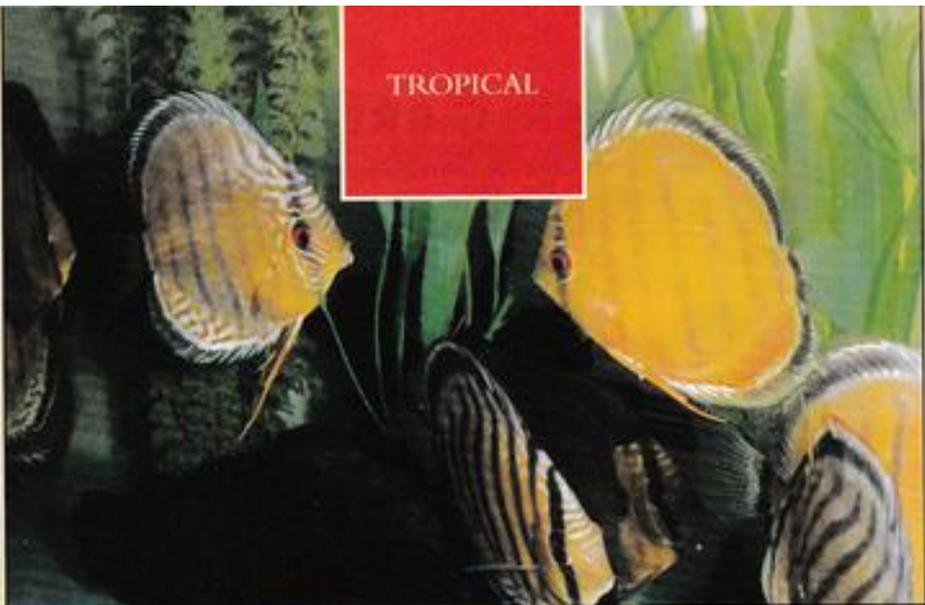
The leaflets are available free of charge from leading aquatic retailers or direct from Hozelock Consumer Services by telephoning their hotline on: 01844 292002.

Details of products from: Hozelock Limited, Haddenham, Aylesbury, Buckinghamshire HP17 8JD. Tel: 01844 291881. Fax: 01844 290344.

Aquatic Postcards

Once people get 'hooked' on anything they will buy absolutely anything that is remotely associated with their interest — ceramic models, tea-towels, badges — you name it, they've got it. For cichlid 'obsessives' there are now sets of postcards: a recently released set of eight depicts scenes of Lake Malawi and fish within its depths. Should you in future get a 'Having a great time' card tracking down its senders will be no problem if you also remember they are cichlid keepers! The cards are available in sets of eight price 85p per set (including p&p). For orders of more than two sets the price falls to 75p per set inclusive.

The sets are available from: Cichlid Press (UK), 1 Copper Oak, East Village, Crediton, Devon EX17 4DW, to whom wholesale enquiries should be directed. Tel: 01363 866509.



TROPICAL

Housing for Wild Discus

BRIAN MIDDLETON LOOKS AT MAKING WILD DISCUS FEEL AT HOME

PHOTOGRAPHS BY THE AUTHOR

I have seen many aquariums over the years and some of the most spectacular have been those housing Wild Discus.

When you have made sure that your Wild Discus are exactly what you require, and you are satisfied that they have been quarantined satisfactorily, you can set about the process of making them a permanent home.

The reason I mention 'permanent' home is that Wild Discus just hate being moved. It causes the wild fish an intense amount of stress: for this reason the less you net, or move, Wild Discus, the better. At this stage I remind you of the ailments that stress can initiate and that is virtually every ailment in the book!

Small Discus travel far more easily than large adult fish. For this reason, if it is possible, buy juvenile fish. They settle down much quicker and with a little care will grow into adult fish,

These are considerably easier to breed than Discus which are caught from the wild during adulthood.

BARE OR FURNISHED AQUARIUM?

If you have more than a couple of aquaria the bare tank set-up is by far the easiest to clean, maintain and observe. Domestic Discus housed in these set-ups do incredibly well and breed normally. It is my opinion that if a Discus is breeding regularly it must be in conditions that are acceptable to it. Wild fish are a different story, my feelings on this are that to keep a Wild Discus in a bare set-up is positively cruel. I would not condone this in any way.

Bearing in mind that cleanliness and observation is even more important with Wild Discus a compromise has to be reached that is

acceptable to both fish and keeper (OR HIS WIFE!) The way I have achieved this is by having a bare tank floor with plants and bogwood.

Because no Discus is fond of bright light and most plants need bright light we hit the first obstacle when a compromise is in order. The way to get over this is to buy some of the best quality plastic plants you can. They are not cheap, but neither is keeping Discus. Then go to your local garden centre and buy a few of the terracotta dishes that you use as a base for flowerpots; the 5in size is the most useful. If you then take your plastic plants, of which the 'Vallisneria' and 'Amazon Sword' type are the best (as the fine-leaved types tend to be magnets for fine debris) and silicone the bases of these onto the base of the dish, then fill the dish up with pebbles which you also silicone into place, this then looks quite acceptable on its own.

It also provides the Wild

Discus with cover which looks perfectly acceptable to you and the Discus. The only other decoration I use is bogwood. It is, however, extremely important to make sure you use the correct type of wood: there is wood around that is extremely heavy and almost steel-like in appearance and weight. I think it is called 'Mopani'. This is ideal but you should let it soak for a week or two before use (putting it in a water butt does the trick), otherwise it leaches a brown tea-like stain into the water, although this does not appear to harm the fish but it is better to be safe than sorry.

Position the bogwood in front of the dishes containing the plastic plants and it looks very natural. The other method I use is to drill holes in the bogwood, pull the plastic plants out of their holders and push them into the holes in the bogwood. This is the only decoration I use for the

simple reason that if you give the Wild Discus too much cover you will never see them!

LIGHTING

In my opinion lighting should be the minimum amount possible: as an example, on a four foot long aquarium two feet of single tube lighting would be perfectly acceptable. I find Gro-lux to be the most acceptable. I first tried Triton tubes but found them much too harsh.

AQUARIUM SIZE

With domesticated fish I recommend 10 to 12 gallons of water per adult fish. With wild fish I recommend a stocking density of no more than one fish per 15 gallons. Another important criterion with Wild Discus is that they must feel secure; if you allow a front to back measurement of at least 18in you will be fine.

FILTRATION

Obviously undergravel filtration is not possible using this type of set-up. I use a combination of fluidised-bed and sponge filtration and it works extremely well. The type of system you use is a personal choice but with Wild Discus you should always over-filter, rather than under-filter, as wild fish are extremely vulnerable to a change in water quality.

WATER QUALITY

You should aim for a pH of between 5.5 and 6.5 except in the case of Heckel, when 5.00 will be more acceptable. Temperature should be slightly lower than for domesticated varieties — around 82°F or 28-29°C. Nitrate, nitrite and ammonia levels should ideally be zero.

Wild Discus are extremely sensitive to metals

in the water. I have found that a combination of Reverse Osmosis and 'Metalex' water to be absolutely first rate and you should try to achieve a T.D.S. (Total Dissolved Solids) reading of just under 100us or 2DH.

In my opinion there is no room for aged water in Discus keeping so change as much water as you find practical, as often as you can.

FEEDING AN ADEQUATE DIET

Wild Discus are in need of much more live food (or food that was alive at some time) than are domesticated fish. Their diet should consist of live Whiteworm and Earthworm, beetleheart, frozen (but well washed) Bloodworm, Mysis Shrimp, Glasworm, Mosquito Larvae, Diskusin and a dried food such as Tetra Prima. If you can get them to eat a variety of these you should have no difficulty. As long as hygienic maintenance is carried out daily you should find very little difficulty in keeping wild Discus. Three extremely important points to look for when purchasing wild fish are: eyes should be in proportion to the rest of the fish, the head should not be pinched above the eyes and, above all, they should be feeding well.

SOME VARIETIES OF WILD DISCUS

Blue Discus (*Symphysodon acquifasciata haraldi*)

The first blue Discus were imported to Germany in 1959 and were seen in the UK shortly after this. They were first bred in the early

1960s by Dr Schmidt-Focke. Fully-striped specimens of this species are known as Royal Blue. They occur in all known catching localities, but they are only caught in extremely low numbers.

The Blue Discus we see today are usually caught from the waters of Lago Manacapuru and the Rio Purus. These fish no longer present any problem to maintain in captivity and are bred without too much trouble.

Green Discus (*Symphysodon acquifasciata acquifasciata*)

Tefe Green
The Green Discus was first imported to Germany in the late 1950s and was again bred first by Dr Schmidt-Focke. Nowadays wild caught Green Discus are mainly imported from Lago Tefe and more rarely from the Rio Tefe and Lago Coari. These wild caught Greens frequently have a spotting in the body and the anal fin.

In a Tefe Green the base colour varies from yellow-brown to red-brown. It is not common for the body to have a high red content. The fish with many spots and a lot of stripes are frequently called 'Royal Tefe'.

Again, there are no particular problems in the keeping of these fish.

Coari Green
The body colour of these fish is brilliant turquoise with a high green content. The body colour is usually fragmented and gives a speckled effect. The anal fin always has a pattern of red dots. The base colour is yellow to red-brown, rarely, the body can be almost solid red. These are the Discus which are known as Red Spotted Greens. They are

one of the most difficult varieties to breed. In reality they are very rarely imported and their price is high.

Brown Discus (*Symphysodon acquifasciata axelrodi*)

This species was one of the earliest varieties to be imported and it used to be one of the most common varieties of Discus on sale. There are, however, a number of red varieties of this fish that are hugely expensive and are from the Rio Madeira, Rio Ica and the Alenquer region. The colour of these fish varies from orange to extremely high red and are basically only striped in the head region. These fish present no problems in breeding or keeping.

Heckel Discus (*Symphysodon discus*)

This species was not seen alive by a white man until 1958 and did not appear in Europe until nearly ten years later. The Heckel Discus is caught in the Rio Negro and the mouth of the Rio Branco and comes from water in which the pH is 3.2 to 4.8.

There are a few different varieties of Heckel Discus, the most sought after being the 'Blue-Headed' Heckel. The desirability of the Heckel lies in its beautifully harmonious body shape. The Heckel is one of the most difficult strains to maintain and has been bred true by only a handful of highly skilled aquarists. The Heckel has extremely specialised dietary and water parameter requirements and is not ideal as a first attempt in keeping Wild Discus!

I hope this has whetted your appetite for keeping Wild Discus. Next month I shall be tackling the subject that seems to be a mystery to a number of Discus keepers, and that is the fascinating subject of genetics, which is so important in the breeding of high-quality Discus.

DIDIPLIS

Didiplis was formerly included in the genus *Peplis* but is now considered a separate monotypic genus in its own right.

DIDIPLIS DIANDRA SYN: *PEPLIS DIANDRA*

De Candolle 1828

Description: A dainty little herbaceous plant, which deserves to be more popular; its use being restricted by its lack of availability. When growing in an emergent state it creeps over the surface of wet soil. When submerged it ascends on thin delicate stems. The pale to dark-green leaves are arranged in an opposite and decussate form. They are linear to narrow lanceolate and reach some 2.5cm long by 3mm in width. In an emerged state the flowers, which are tiny and inconspicuous, develop in the axils of the leaves.

Distribution: Southern states of North America. Now extensively cultivated in aquatic nurseries in South-East Asia from where most plants are now obtained.

Cultivation and Propagation: This species does not enjoy high temperatures in aquaria; between 18-20°C suits it best. It should be planted in clumps in the foreground of deep tanks and the middle ground in shallower ones. The slender foliage will provide a good contrast to robust species. Pruning should be carried out at regular intervals to ensure bushy growth. It appreciates a slightly shaded position and a fine, sandy substrate.

ECHINODORUS (Amazon Swordplants)

This large and extremely important genus to aquarists is limited in its distribution to the New World. Their headquarters are in South America but range northwards encompassing Central America, the Southern States of North America and certain related island groups. Their morphology is based on a rosette formation of leaves and stems. All are herbaceous with simple undivided leaves simply lanceolate to broadly ovate born on long petioles. Many multiply rapidly by runners and may be clump-forming. The complicated inflorescences often develop adventitious plantlets.

There are approximately 50 species (some reaching sizes which are far too large for aquaria) whilst others are diminutive carpeting plants which are ideal for the foreground of even quite small aquaria. Because of their rosette formation the medium-growing species are best used as accent or specimen plants in the middle ground in aquaria.



LARGE SPECIES

ECHINODORUS BLEHERI SYN: *E. PANICULATUS*
(The Amazon Swordplant) Rataj 1970

Description: Grown by the thousands in Singapore there can be few aquarists who haven't had some experience with this species. A beautiful and hardy plant with a rosette of short-petioled, slender to broadly lanceolate, pointed leaves. These are light to mid-green. Most imported specimens are imported after having been grown in an emergent state. These quickly acclimatise to underwater conditions but the emergent leaves first develop large brown spots and then die. However, they are quickly replaced by less rigid and paler green submerged foliage.

Distribution: Central South America.

Cultivation and Propagation: Will grow very well in unwashed gravel but even better plants are obtained with a rich substrate. Lighting of medium intensity suits this species best. It will grow in a wide range of waters including those with an alkaline tendency, but cleaner plants will develop in soft, slightly acidic conditions. When mature long inflorescences are produced which tend to bend down beneath the surface producing adventitious plantlets along the last few inches. These should be pegged down into the bottom with lead wire and severed from the parent plants when about 9in tall and replanted. This species forms a magnificent specimen plant in time and will need plenty of space around it to reach its full potential.

ECHINODORUS MAJOR
(The Ruffled Swordplant) Rataj 1967

Note: This plant was first described as *Echinodorus martelli* by Micheli in 1881 and was known in Europe by this name until just a few years ago.

Description: Similar in broad details to the aforementioned species but the leaves are blunt-tipped and have wavy edges giving the plant a very distinctive and interesting appearance.

Distribution: South America in the Brazilian states of Goiás and Minas Gerais.

Cultivation and Propagation: Grows only poorly in an immersed state. It prefers large, well illuminated aquaria with a temperature of at least 25°C to give of its best. It also prefers soft water with a pH not above 7. In pure, unwashed gravel it seldom does well. A rich lateritic substrate and regular fertilisation will reap rich dividends with *E. major*. The plant flowers freely and if allowed to grow above the water surface and pollinated by hand viable seeds will be formed. In addition adventitious plantlets will form and may be treated in the same way as for *E. bleheri*.

A to Z of plants

By

**BARRY
JAMES**

New National Junior Fishkeeper's Association

On 2 January 1997 the National Junior Fishkeeper's Association was formed. John Pell, NJFA Secretary, writes: "I believe many of A&P's younger readers will be interested in the formation of a new National Association specially formed with the younger fishkeeper in mind. The Association has the full support of the Trade with such major names as Rolf C. Hagen, Interpet, Aquarian, TFH Publications, Bullseye Trophy Centres and others, together with hobby groups and Societies. Its aims are to promote and further aquatic and other associated interests and encourage the cooperation of individuals and groups of young people within the fishkeeping hobby.

"Junior fishkeepers, in the age range of eight to 16, are able to join by completing a simple application form — MEMBERSHIP IS FREE. Members will receive the quarterly magazine 'Fishworld'. This publication presents articles written by hobbyists and will feature a Junior Section specially added for the Association, to include competitions and other items. They will also receive a Badge and a Membership Card. There will also be, from time to time, additional features and special offers.

For more information and/or a membership application form a stamped addressed envelope should be sent to: The General Secretary, NJFA, 44 Lakewood Drive, Wigmores, Gillingham, Kent ME8 0NS. The Membership Officer, NJFA, 22 Flamsted Avenue, Wembley, Middlesex HA9 6DL.

KAAS Convention '97

The KAAS Convention '97, sponsored by the Federation of British Aquatic Societies, will be held at Smithy's Hotel, 57 Norfolk Road, Cliftonville, Kent.

The programme will be along the following lines:

1.00pm Open; 1.20pm Chairman's welcome; 1.30pm Guest Speaker, Dr Daryl Siebert — 'Borneo Experience'. Daryl is an American currently working

at the Natural History Museum in London; 2.30pm Refreshment break; 2.45pm Quiz; 3.45pm Refreshment break; 4.00pm Guest Speaker, Mary Rauchenberger — 'Rio Paruco Swordtails'. Mary is Daryl's wife and is recognised as one of the leading experts on livebearers; 5.00pm Refreshment break; 5.15pm Auction of Fish and Raffle; 8.00pm Guest Speaker, Brian Walsh — 'Fishkeeping My Way'. Brian's talk is complete with two audiovisual presentations; 9.00pm Chairman's thanks and close. The times are, of course, approximate.

The cost for the Convention itself is £10 per person. Entry will be by ticket only, available in advance, from: Allan Best, 73 The Fairway, Rochester, Kent ME1 2LT. (Cheques and Postal Orders made payable to 'KAAS' please).

For Friday and/or Saturday overnight accommodation at the hotel please contact them directly on 01843 221980 when mention of the 'KAAS Convention' should secure you B&B facilities at £22.50 per person per night.

There will be the usual 10 Pin Bowling Competition on Sunday morning.

Doncaster show date

Please note that the Yorkshire Aquarists Festival will be held at Doncaster Racecourse over the weekend of 5-6 April and not as shown in the January issue of A&P. Apologies to the organisers for this error.



OPEN SHOWS

(Rule Codes: A = A of A; FB = FBAS; FN = FNAS; FS = FSAS; I = International Goldfish Standards; N = NEFAS; U = USofA; Y = YAAS)

2 March Burley-in-Wharfedale A.S.
15 March Kent Association of Aquarist Societies Convention, Smithys Hotel, Margate, Kent
30 March Northampton A.S.

5/6 April Anabanti Association of G.B. Weekend, Sorby Hall, Endcliffe Vale Road, Sheffield

5/6 April Yorkshire Aquarist Festival, Doncaster

7 April Eastleigh A.S.
13 April Abernare A.S.
20 April Strood A.S.
27 April Robin Hood Aquarists

3 May Southend, Leigh & D.A.S.

4 May Musselburgh A.S.
11 May Corby A.S.; Four Lane Ends A.S.
11 May C.A.S.T., 89

16/18 May Grocklemania
18 May Isle of Wight A.S.

7 June South Park A.S.S.

14 June Bristol tropical A.S. (new date)

15 June Halton A.S.
22 June Workington A.S.

29 June Seascale Junior Fishkeepers

5 July Port Talbot A.S.

20 July Bourneham A.S.

27 July Kent Association of Aquarist Societies

24 August Cramlington A.S.

24 August Tyme Tees Area Association

30/31 August Fishworld '97, Dunstable

13 September Hounslow A.S.

12 October Solway A.S.

25/26 October British Aquarists Festival, Bowlers, Manchester

31 October/2 November Supreme Festival of Fishkeeping, Weston.

2 November Supreme Championship and Open Show

DIARY DATES

FEBRUARY

4 Gloucestershire A.S. Monthly meeting, Bell & Gavel, Castle Market, St Oswalds Road, Gloucester. Proposed visit to a local aquatic outlet with a 'behind-the-scenes' look. Contact Andy 01452 372948 or Christina 01242 520428.

7 South Coast Cichlid Group. Talk by Gordon Anderson on Cichlids of Lake Tanganyika at the Stadium Public House, Old Shoreham Road, Hove. 7.45pm. More details from Sonia, 01273 887741.

16 Northern Area Catfish Group. Annual Convention, The Mill at the Pier, Wigan Pier, Wigan, Lancashire. Speakers: Petr Pozel and Michael Hardman. Massive 'Bring 'n' Buy Sale' — all bags of fish must be labelled with name and price — heated floating tanks available free of charge. Trade Stands. Enquiries to: Bill Hurst (01704 213690), Trevor Morris (01942 242386) or G. Barlow (01706 210789 or 01254 388815).

23 Oasis Fish Club Auction. Thompson Park Community Centre Monkwearmouth, Sunderland. Club meets on first Wednesday of each month. Contact Avril Banks, 0191 3841433.

MARCH

2 Clacton F.C. Auction. 12 noon, Bocking Elms Hall, Clacton. Booking in 10am. Enquiries to Robert Brixton, 01255 821937.