



To the text of the biotope aquariums for Neon and Cardinal tetras (and note, that for the blue Neon, *Paracheirodon simulans*, the habitat is the same as for the Cardinal tetra, as they live in identical biotopes), here three more samples of how to decorate it (or not).

Aquarium left: Here we see a decoration for a Cardinal biotope which is in part correct, at least most of it. The *Aponogeton ulvaceus* in the far left is wrong and the *Sagittaria platyphylla* in the foreground as well. Better to leave a sandy space open and add a driftwood piece. Also maybe some other fishes (as mentioned in the text).



Aquarium left: This was to be a biotope Neon tetras and is also not bad, but should definitely have white sand between the rocks and driftwood is missing – actually needed. One can argue about the *Hygrophila difformis* in the right corner, and also the *H. polysperma* in the background (both from Asia), but the others are South American species, although none from a real neon habitat, except the *Echinodorus tenellus* in the foreground, which are from the Neon biotope area.



Aquarium left: Here we see an authentic, natural biotope (as right side) for cardinal tetras. And one can see that all fishes feel very well, like at “home”, although they have just been placed in the tank. They swim immediately in schools together with *Hemigrammus bleheri*, exactly as in nature. Even the *Corydoras* join in (left corner). This shows again, that a real (close to nature) biotope aquarium brings happiness to the fishes and also to the owner of the aquarium...

Introduction

Nowadays we live in a world where “wildlife conservation” and “appropriate animal husbandry” are written about extensively and the subject of legislation in many countries, including much of the European Union. People are no longer allowed to keep animals – or do anything, for that matter – according to their own ideas, and we must bear in mind that sooner or later it will likewise become obligatory to keep ornamental fishes “in the proper way” for the species in question. But how many people actually know what the proper way is for any particular species? How are they to find out? Neither the legislators nor the existing hobby literature offer any concrete help. How so? Because only a handful of people have conducted on-the-spot research and the legislators rely almost entirely on their data. In rare cases this may mean information from just one expert. Assuming there is one!

In addition we will show you how best to simulate the natural habitat of these fishes in your home, so that you not only maintain them in the “proper way” but also find them a source of immeasurable enjoyment.

The neon and cardinal tetra aquarium

First and foremost, we implore you to buy your tetras ONLY at a retail outlet you can trust. One where the fishes are visibly maintained and cared for properly (eg no dead or dying specimens floating around), and where all purchases are netted and packed with the utmost care – always remember, these are living creatures just like you, and should be treated accordingly. But, before you buy a single fish your tank must be established, ie set up and the filter matured for at least 7 days.

Setting up the aquarium: first of all, bear in mind that both species are shoaling fishes, and hence the aquarium should be at least 80

cm, and if possible 100-150 cm (or more), in length, with a width and depth of at least 40 cm (the wider the better, for ease of setting up and from the viewpoint of the fishes). Use very fine white sand for the substrate. Then position one or two pieces of well-washed bogwood or driftwood. Half fill the tank with water before adding the following aquatic plants, if possible: a *Cabomba* species (*C. furcata* or *C. aquatica*), and a reasonable amount of it; then a few tiger lotus (*Nymphaea lotus*) of varying sizes; one of the pennyworts (*Hydrocotyle leucocephala* or *H. ranunculoides*); plus the aquatic moss *Mayaca fluviatilis* or Bleher’s swordplant (*Echinodorus bleheri*) – although the last two are not in fact biotope-correct, they are well suited to the cardinal tetra aquarium. You may also like to include two other swordplants, *E. parviflorus* and *E. horizontalis*, in the neon tetra aquarium. Both these *Echinodorus* species occur in the biotope of the neon tetra, but there are no swordplants in the natural habitat of the cardinal. Once the plants have been set in place, the rest of the water can be carefully added.

If your aquarium does not have an integral filter, then you can choose a suitable external filter. Either way, it is important that initially the filter media consists of mechanical and biological media along with activated carbon. Let the filter mature, and do not add your fishes until the minimum of one week has elapsed. (Note: Once your aquarium is biologically balanced and the water clear, you can discontinue the activated carbon medium and replace it with peat to provide optimum water conditions for this particular biotope).

The fish population for the aquarium: As mentioned initially, find a reliable dealer. Purchase a nice shoal of neons or cardinals – the number will depend on the size of your aquarium: you can keep 50-60 medium neons

or 40-50 medium cardinals in a 120 litre aquarium without worries. In addition, a neon aquarium of this size can house about 10 dwarf cichlids of the genus *Apistogramma* (ideally *A. cacatuoides* or *A. bitaeniata*), 6-8 splash tetras (*Copella* species), the same number of pencilfishes (*Nannostomus marginatus marginatus*, *N. m. mortenthaleri*, or *N. eques* - or 2 of the three). You will need a few dwarf suckermouth catfishes (*Otocinclus arnoldi*) and mailed catfishes (*Corydoras elegans* or *C. leucomelas*) – in each case about 12 individuals. For the cardinal tetra aquarium the general composition of the fish population can be similar, but omitting *N. m. mortenthaleri*, and substituting just *C. schwartzi* as the mailed catfish and, as the dwarf cichlids, only *Apistogramma mendezi* or *A. steindachneri* or *A. iniridae*, and adding 20-30 brilliant rummy-nose tetras (*Hemigrammus bleheri*). Both biotopes can also include about 6 marbled hatchetfishes (*Carnegiella strigata*). Larger fishes are not recommended, apart from the angelfish (*Pterophyllum scalare*) and then only 3 or 4 small specimens. For larger or smaller aquaria the population can be increased or reduced pro rata.

General: maintain the water temperature at 25-27 °C and allow 10-12 hours of good lighting. The water should not be too hard and have a neutral pH (about 7) – but a lower pH will produce better coloration in the fishes. Change the peat regularly, and periodically wash your filter media in warm water. It remains to wish you good luck.

This aquarium had 250 Cardinals, 100 brilliant rummy nose tetra (*Hemigrammus bleheri*), 25 *Corydoras* species, 40 *Otocinclus*, 30 *Nannostomus* (*N. eques*, *N. marginatus*, *N. unifasciatus*), red and green *Cabomba*, *Nymphaea* and *Hydrocotyle*.

Here is a 2 m long biotope aquarium for cardinal tetras that we have set up at the Aqua-Xpo 2001 in Hasselt, Belgium, at the world’s largest aquarium exhibition. It was set up to simulate precisely how these fishes live in the affluents of the middle Rio Negro, with the number of fishes that would be found in this volume of water (480 liter) in nature.

RIO NEGRO







Above 3 suggestions for a Guppy biotope aquarium (pros and counter): The upper aquarium is nicely decorated, and a real good display for a Guppy aquarium, almost nothing to counter. (you only have to choose, which kind of Guppies you prefer, I would place wild ones, as on the previous page). Center is defiantly fine, but please not *Aponogeton fenestralis* (=Madagascar...). And the lower aquarium: is the taste of Buddha? (maybe because the Guppies breed in Asia?). In any event, the rest of the decoration is nice, and if tank breed Guppies imported from Singapore, why not a Buddha...

The Guppy Aquarium

Every beginner in the aquarium hobby should start with guppies – but experienced aquarists can likewise find great pleasure in these swimming rainbows. But everyone should first of all ask themselves, “Do I want an aquarium with a population of wild-type guppies, or would I prefer a “tapestry” of the larger cultivated forms – or a mixture of both types?” The wild forms are more active. It is easier to observe their courtship, and they breed more rapidly. On the other hand, the “fancy” types give the aquarium more colour.

Once that is decided – there is plenty of advice in the literature and on the Internet (eg at www.altavista.com search for: Guppies, “*Poecilia reticulata*”) – then you can decide which types you like best and visit a high-quality dealer to obtain healthy stock – never buy guppies that can’t swim properly, or from tanks where there are fish lying on their sides, wobbling around, or even dead. But, before you buy any fishes, you must first set up their aquarium.

Setting up the aquarium: When buying an aquarium, always remember that the larger the aquarium the more attractive it will look, and the more space the fishes will have for swimming. But a 60 (long) x 30-35 (wide/deep – the wider the better where the decor is concerned) cm will suffice in this case.

If possible, obtain some fine white sand or light quartz gravel for the substrate – about a 5 cm layer is required, a little deeper at the back. First rinse your new tank well with warm water – no soap or detergent! – and check whether the sand has been well washed (regardless of what it claims on the packing). For decor we recommend a few nice pieces of bogwood and stones, and a good selection of attractive aquatic plants. Particularly good (and biotope correct) choices include *Cabomba* species and the Guiana willowleaf, *Hy-*

grophila guianensis (small-leaved willowleaf, *H. polysperma*, will do instead). The dwarf chain sword (*Echinodorus tenellus*) is ideal for the foreground; it will form a carpet above which the fishes will be seen to best effect. Alternatively you can use the somewhat larger dwarf swordplant *E. quadricostatus* (see below, left-hand biotope). And, finally, one to three specimens of the larger swordplant *E. horizontalis* or *E. osiris* (as in the left-hand corner of the biotope below left) which is highly decorative. You can also plant lots of *Ludwigia repens* (as in the biotope below right) – again very attractive decoration.

Put in the sand, wood, and rocks, then half-fill the aquarium with water before planting. Finally fill up the aquarium. Always bear in mind that guppies feel particularly happy and show their best colours with good plant growth as cover. So don’t stint on the plants.

If the aquarium purchased doesn’t include a built-in filter, then you can add either an internal or an external. The filter should be filled with biological media, and if you use a biological starter then you can add your fishes a day later.

Fishes for the aquarium: As already mentioned, choose the guppies you like. As a rule of thumb you can add 1 cm of fish per 2 litres of aquarium water, ie a 60 litre aquarium will house 30 cm of fish or 15 male guppies at 2 cm (average adult body length) apiece. Note that this rule is based on the body length (= Standard Length, SL), ie not including the tail. If you want to keep other fishes with your guppies, then we recommend other livebearers of the family Poeciliidae, eg green or red swordtails (*Xiphophorus helleri*) and platies (*Xiphophorus maculatus*), which are available in numerous colour varieties at any good aquarium store. Other good tankmates include bristlenose catfishes such as *Ancistrus hoplogenys* and *A. temminckii*.

These “suckermouth cats” remain small and eat unsightly algae. They do not in fact occur in the natural habitat, where there are instead other suckermouths, of the genus *Hypostomus*, but the latter are not recommended as they grow too large and may nibble the plants. Another catfish that does occur in the biotope is the bronze catfish (*Corydoras aeneus*), ideal for sandy substrates. If you decide to keep these then make sure you have a small group and that you leave an area of open sand as they like to “nose around” in the substrate for small organisms.

When you buy your fishes don’t forget that the trade almost always offers cultivated forms of guppies, swordtails, and platies, and these, of course, are not found in nature. So, if you want to be “biotope correct” you will have to hunt for wild fish or captive-bred wild forms. They are available, and then you can proudly display an aquatic microcosm representing Venezuela, Trinidad, or even Mexico in your home. And you will certainly learn more than from the cultivated forms.

General: Maintain the water temperature at 24-27°C and light the aquarium for 10-12 hours each day. The water should be slightly alkaline, pH values below 7 are unnecessary. Let the biological filter media do their job and change some of the water regularly.

The only other thing these little splashes of colour need for successful maintenance and regular breeding is food. And you will have hands-on experience of evolution in your biotope-in-miniature.



These two Guppy aquarium decorations are actually more Guppy nature biotope like, but the Guppies in both are Guppies from breeding stock, this is a question of taste. But what makes it nice: lots of plants and only Guppies, no other fishes mixed into it. This is nice, specially for a small aquarium.





Three sample decorations for angelfish biotopes (the pro and counter):
Aquarium left: This is a very nice nature-like biotope, almost authentic to the Rio Nanay, where these wild angels come from. They felt immediately perfect. In hamony.
Aquarium in the middle: This is an authentic angelfish biotope from the Rio Mineruá, in the Amazon. The angels live together with green discus and swam with the same immediately after placed in the aquariu, formed a natural school, as in their habitat. And one should remember: do never place wild fishes together with tank raise specimens, it can cause (and most of the times) big problems. Wild with wild is fine.
Aquariums below: If one is to have tank raised angelfishes, than please put, as here shown, only those together. The decoration is for these up to its owner, as such altered colour variants have little of the gen from the wild angels left...



The angelfish aquarium

Almost everyone who starts maintaining an aquarium sooner or later becomes aware of the angelfish. It is – and always has been – a majestic creature, an (almost) indispensable adornment for any underwater landscape. Its elegance, its extremely long fins (present in all but a few cultivated forms), jerky swimming movements, inquisitive look, and its constantly repeated search (in adults) for a nice big leaf (or undisturbed spot on the aquarium glass) on which to lay its eggs, all provide endless fascination. Likewise the way two individuals sometimes face up to each other with widespread fins, as if in rivalry, is a real wow. This is, however, not actual aggressive behaviour, as these are truly the most peaceful of fishes – like discus, their close relatives, often found together with the angelfish in nature. (But *P. altum* and *P.*

leopardi are not found with discus in nature.)
 Now if you want to provide this former king of the aquarium fishes with an optimal home and enjoy it to the full, here are a few simple suggestions as regards to the biotope.

Setting up the aquarium: As usual, the larger the better, but for the angelfish the aquarium should be at least 100 cm long and 35 cm wide (or wider), and 40-50 cm deep. (For Altum angelfishes at least 120 cm long and 60 cm deep.) We also unreservedly recommend (biotope correct) fine white sand. This should be at least 5 cm deep (8-10 cm deep at the rear) – and, of course previously well washed (always check sand sold as “washed”). A number of nice pieces of bogwood are indispensable – either pre-soaked or weathered over a long period. If you want to add rocks then please use rounded ones, as the fishes may injure themselves on sharp rocks. It is advisable to plant the aquarium: as can be seen from the biotope aquarium below left, the so-called Peruvian Altum is often found with the

large-leaved horizontal swordplant (*Echinodorus horizontalis*). The common angelfish and Bleher's swordplant (*E. bleheri*) are a good combination. But in all cases a few large swordplants. You may also care to include – more for the foreground and between the pieces of bogwood – the dwarf, grass-like swordplants (*E. quadricostatus* and *E. tenellus*), both of which are carpet-forming. For the sides (or in between) *Hydrocotyle leucocephala* and a further group of *Hygrophila guyanensis*. You must, of course, decide for yourself whether or not to add lots more plant species. Those mentioned are biotopecorrect, except that the majority of angelfishes do not occur in areas where aquatic plants grow. Like discus, for the most part they make their homes among roots, branches, and fallen trees, as well as trailing greenery (at high water). The tank will look rather

different with a population of only, or mainly, tank-bred angelfishes or cultivated forms. Or, if you deviate from the actual biotope and mix cultivated discus varieties with wild-caught angelfishes – and Altum angelfishes (which we really do not recommend), then you can add plants that are alien to the biotope. It is, however, important always to allow a large amount of open swimming space for angelfishes.

The fish population for the aquarium:

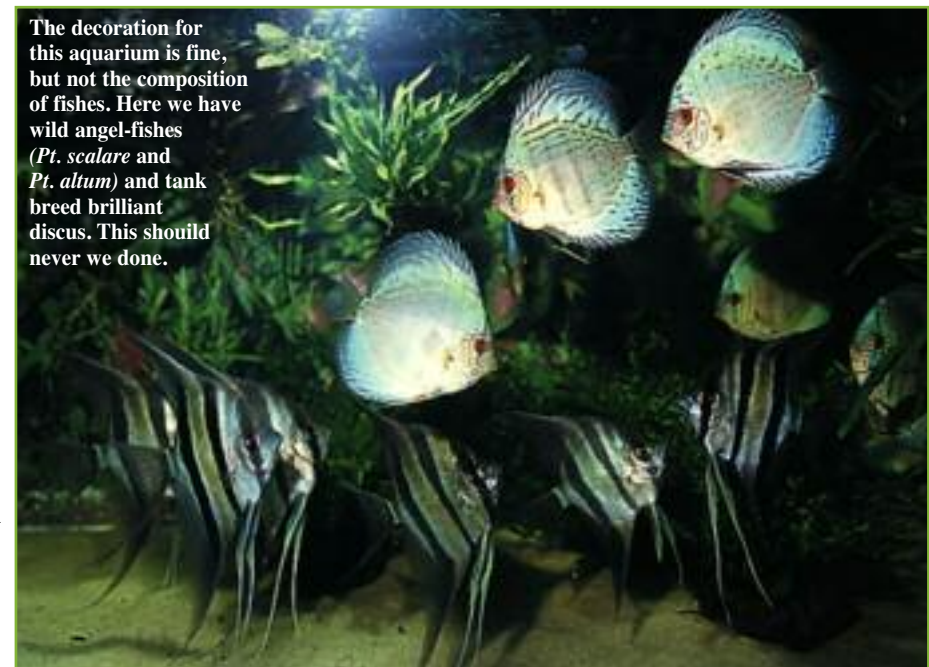
Here the question arises: do you want to be biotope correct, as then you should mix only wild-caught individuals or tank-breds of natural forms (ie one, two, or all three of the species mentioned: *P. scalare*, *P. altum*, *P. leopoldi*). Next there is the question of small specimens or those already adult: if small individuals, then start with a group of 8-12 in the size of tank cited. Fewer if larger, and

with Altums only about 4 in 100 l. As tankmates in such a tank you can add a group of mailed catfishes (eg 6-8 *Corydoras leucomelas*, *C. atropersonatus*, *C. trilineatus*, or a mixture). About 10 *Otocinclus arnoldi* to eat algae. Plus 1-2 groups of tetras will look nice. About 10 brilliant rummynose tetras (*Hemigrammus bleheri*) and 6-8 bleeding heart tetras (*Hyphessobrycon erythrostigma*). Always remember that the total number of fishes depends on the rule: 1 cm of fish per 2 l of aquarium water.

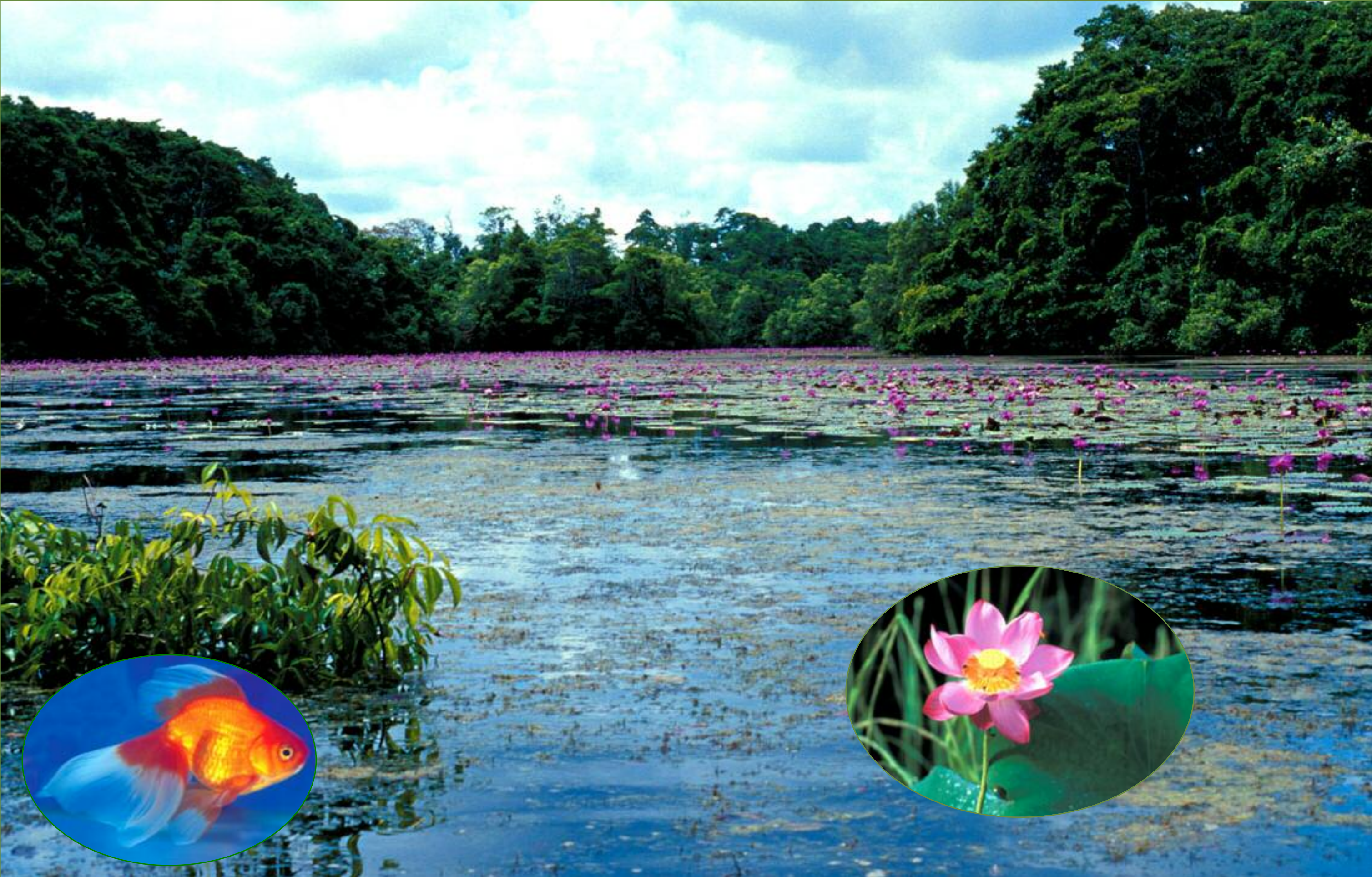
General: The water temperature should be 25-29°C (max. 30°C); The lighting should be on for 10-12 hours per day; the pH about 7 – up to 8 doesn't matter too much (except for Altums); allow biological filter media to do their work; change water now and then; feed young specimens several times daily, adults once per day; and that's it. And then you will have many hours of educational viewing – often better than the TV.



This is a good biotope aquarium decoration for angelfishes, although there are, together with the wild angels also tank raised ones – it is still ok.



The decoration for this aquarium is fine, but not the composition of fishes. Here we have wild angel-fishes (*Pt. scalare* and *Pt. altum*) and tank breed brilliant discus. This should never be done.





What can be said or shown for a goldfish biotope? Practic all forms of goldfishes today in the hobby are fishes changed by man (some to the most abstract forms and colours). And I can hardly suggest any of the three aquarium decorations shown on this page, for gold-fishes. But let me shortly mention one by one.

Aquarium on top: this is a table aquarium – closed from the top (I think made in Russia), those fishes will suffer very much and it is not good (although looks nice).

Aquarium in the center: This kind of decoration is already somewhat better, but not with *Echinodorus uruguayensis* – much better lots of large *Vallisneria* in the background and a few *Nymphaea* species instead. Also, it should have some natural gravel on the bottom and not lava stones. The larger stones are ok.

Aquarium to the left: This is terrible, and murder for goldfish. My grandfather already condemd the round glasses (this was back in the late 19th century, when people started to relize, that such round glasses drive the fishes insane, as they must swim in circles all the time, and that is the same if we had to walk our entire life in circles...). Theplants and decoration is nice, but not the round tank...

The Goldfish Aquarium

Every newcomer to the aquarium hobby should start with guppies or a goldfish aquarium (and experienced aquarists can enjoy them too). Goldfishes are amongst the hardest ornamental fishes, and this is one of the reasons they have been kept for more than a thousand years. Today the original goldfish is still found in the waters of China, which freeze during the winter months. It lives beneath the ice (and sometimes in it), at temperatures around freezing point, and survives. In the same biotope where in summer the water heats up to more than 30 °C – I have measured up to 41 °C.

These are points that should also be borne in mind when purchasing goldfishes (young or old), and, of course, you must decide whether to keep them in a pond, an aquarium, or perhaps even in a paludarium. The traditional Asian method, still practised today, of keeping them in open-topped earthenware basins, porcelain bowls, or vessels of jade has never really spread further afield, and for a number of reasons is best reserved for specialists and for the more extreme forms, and hence I will not discuss it here. Likewise the goldfish bowl (in the interests of appropriate maintenance as well). From the viewpoint of the (normal) goldfish a pond is the ideal habitat, and this is generally the only environment where it will breed without the intervention of the owner. But I won't go into pond maintenance here either, as there are (almost) innumerable publications on the subject, and instead we will deal with the aquarium maintenance of goldfishes and provide a few simple (biotope) suggestions. As an aside, however, I do also recommend ornamental carp for a pond, and that the pond should be populated with a natural, native fauna and flora.

Setting up the aquarium: From an aquarium ecology viewpoint, the same general principles apply to a goldfish aquarium as for (almost all) other aquaria. In other words, don't allow anyone to tell you a small aquarium will suffice for goldfishes. I recommend a tank at least 100 cm long (they need swimming space, just like discus, for example) and 35 cm wide (the wider the better), and at least as deep. Use medium (grain size 0.2-0.6 mm) or coarse (0.6-2.0 mm) sand, never more than 2 mm as goldfishes like to dig. Fill the tank with this to a depth of 5 cm – somewhat more towards the rear – but only after rinsing out the tank with warm water and making sure that the sand is also well washed. Don't forget to include some (true) aquatic plants (often people think goldfishes don't need them, or eat them). The plants will enrich the water with oxygen, utilise the inevitable metabolic by-products of fishes and bacte-

ria, and provide micro-organisms with surfaces to colonise. And thriving plants are the most effective answer to algae. Two groups of plants are advisable (as plants are part of the goldfish's natural diet, but they nibble only at soft-leaved plants, and at small or new, tender leaves). One group should be a more robust type such as vallis (*Vallisneria species*), which is both suitable and biotope-correct. One end of the tank, or



These two biotopes above are more goldfish like. The upper is the typical pond, ideal for goldfishes – even in the winter – with *Nymphaea* in it. The aquarium above is actually an paladarium and a perfect environment for goldfishes

part of the background, should be densely planted with such plants, as goldfishes also need a place to hide. Vallis grows well under fairly bright lighting (and maybe CO₂ fertilisation). Other suggestions are a waterlily (eg *Nuphar lutea*), which likewise won't be eaten, a *Bacopa* species, and Java moss (*Vesicularia dubyana*), in which goldfishes love to search for small invertebrates. Useful plants for “snacking” include, for example pondweed, *Egeria densa* or *Elodea canadensis*, which grow rapidly (they can readily be propagated in another tank and transferred as and when required); or hornwort (*Ceratophyllum demersum*), which will generally continue to grow floating – given good light. If you decide on an open-topped tank then floating plants such as water lettuce (*Pistia stratiotes*) or riccia (*Riccia fluitans*) can be added. Other decor can include basalt, granite, or lava rocks, as well as well-weathered bogwood.

Fishes for the aquarium: This is largely a matter of personal taste. On pages 5-6 you will see a few of the many variations in shape and colour. Basically, I suggest avoiding the forms intended to be viewed from above, such as celestials, bubble-eyes, and buffaloheads. Telescope-eyes should also be viewed with caution, as the eyes protrude so far that they can easily be injured (especially during netting). Recommended forms include: veiltails – red/white (also called sarasa) or the colourful calico; the type of veiltail first bred in the USA which is less high-backed; veiltail fantails, a western form; comets, Bristol shubunkins, London shubunkins; plus orandas, lionheads, or eggfishes. (The last of these has almost died out, definitely only a cultural loss.) It is important not to try and keep any of these forms at low temperatures like common goldfishes. The very fancy varieties are acclimated to warmer temperatures.

General: Goldfishes require good lighting and a suitable power filter that turns over the aquarium volume a minimum of 2 to 3 times every hour. A heater is unnecessary as long as the water temperature doesn't drop below 18 or 17 °C in winter. Allow the planted aquarium to run without fishes for 14 days to allow it to mature biologically (this will also allow the plants to root), allow your goldfishes adequate swimming space, and don't overpopulate the tank: as a rule of thumb, 1 cm fish (total length) per 3 litres of water.