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FIRST QUARTER 2022 VOLUME 6

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CLEAR STREAM

By Christian Berthou

This tank's small size made it difficult to plan the scape in much detail. I knew that I wanted wood to be the main element, so the hardscape would be the defining feature and have a strong influence on the overall look. I started this tank by hunting for some cool pieces of wood and building from there.

About the Author

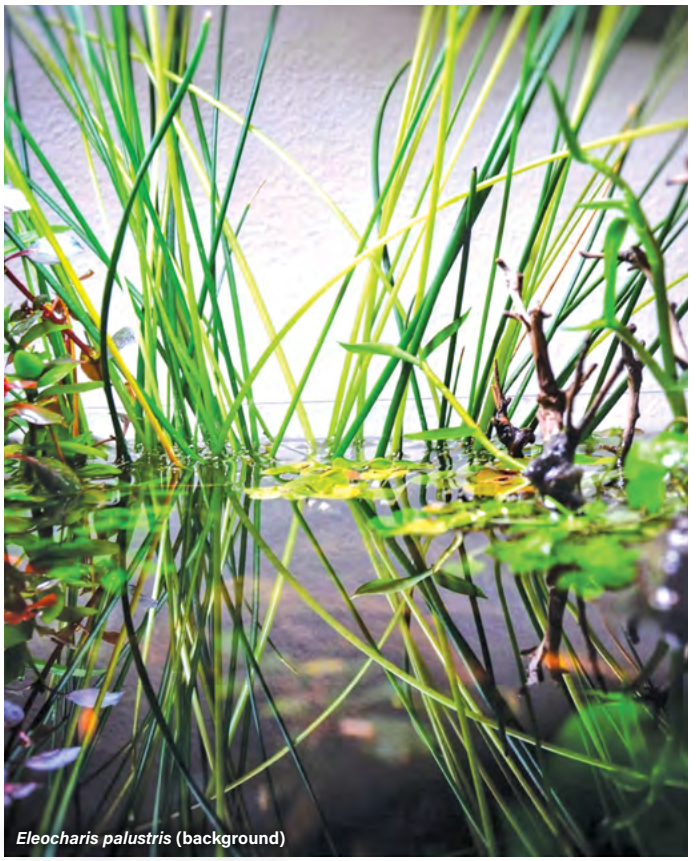
Christian is a sales manager at a furniture and interior design store in Copenhagen, Denmark. He's been keeping fish on and off for 20 years, the last 8 years straight. Check out more of his work on Instagram by searching "my.aquarium.photography."

Aquarium

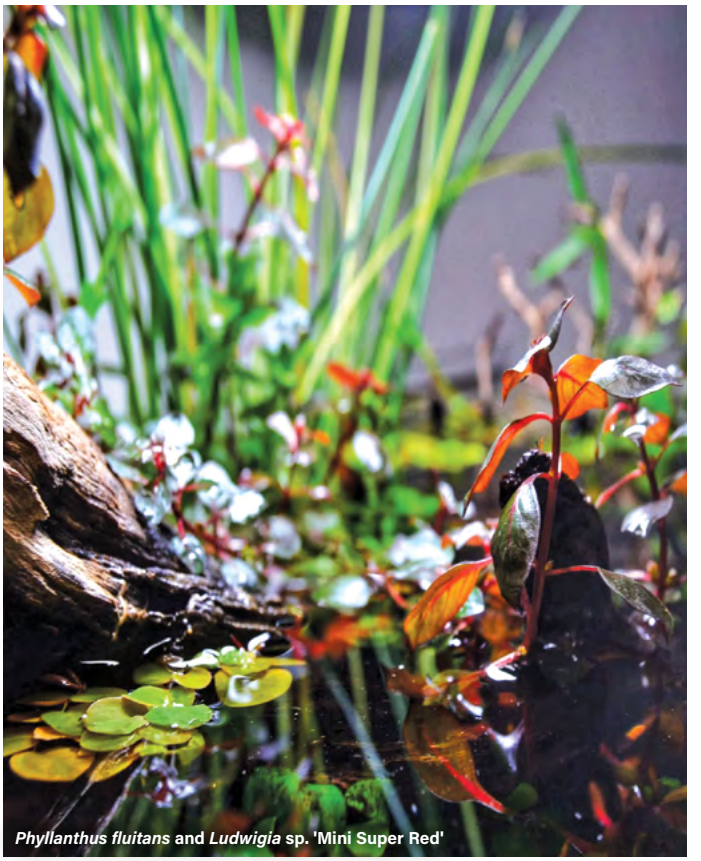
Tank: ADA 45F Cube Garden
Dimensions: 18″ × 9.5″ × 6.5″
Volume: 4.2 gallons
Cabinet: IKEA cabinet

Aquascape

Style: Nature Style
Substrate: Tropica Soil Powder (background), ADA La Plata Sand (foreground)
Stone: Seiryu and Frodo Stone
Wood: driftwood
Other: ADA Aqua Gravel (pebbles)



Eleocharis palustris (background)



Phyllanthus fluitans and *Ludwigia* sp. 'Mini Super Red'

Equipment

Lighting: ONF Flat Nano
Photoperiod: 8 hours
Filter: OASE FiltoSmart Thermo 100
Filter Media: Seachem Matrix, Eheim SubstratPro
Filter Pipes: glass spin outflow
CO_2: Noursun regulator, Twinstar Neo diffusers

Maintenance

Water Changes: 50–60 percent every 5–7 days
Fertilizers: Tropica Specialised Nutrition 1 mL daily or every other day

Food

- Tetra Pro Menu
- Vitalis Tropical Pellets
- Tropical freeze-dried brine shrimp

Plants

- *Ludwigia* sp. 'Mini Super Red'
- *Hydrocotyle tripartita*
- *Murdannia keisak*
- *Bacopa caroliniana*
- *Hygrophila lancea* 'Araguaia'
- *Rotala indica* 'Bonsai'
- *Eleocharis palustris*
- *Eleocharis acicularis* 'Mini'
- *Phyllanthus fluitans*

Fish

- (3) Clown Killifish (*Epiplatys annulatus*)

Invertebrates

- 20–30 Red Cherry Shrimp
- nerite snails AH

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Molly swimming to eat mosquito larvae | Image by showcake

The Importance of Cognitive Stimulation for Aquarium Fish

By Dr. Penelope Carbia-Kolevski

Our understanding of fish sentience has expanded exponentially in recent decades, with more and more research pointing to just how similar fish are to our other pets. They create long- and short-term memories, feel pain, establish social hierarchies, and look after their young. As an aquarium hobbyist, you may have observed some or all of these behaviors among your fish. And if you've ever owned cichlids, you know their parenting skills are virtually unmatched in the freshwater world. Experienced aquarists know their fish are individuals with individual characteristics, personalities, and preferences. In light of all this (relatively) new knowledge, we have the added responsibility of providing a home where our fish don't just survive but thrive.

Perhaps one of the most intriguing beliefs that we've developed from keeping fish in captivity is that they get bored like us. Boredom can manifest itself in various ways, but it tends to show up as unnatural behaviors toward objects or other individuals. So, how do we keep our aquatic pets entertained? Through enrichment. Enrichment is a great way to provide our fish with stimulation, and there are plenty of ideas analogous to a ball for dogs or a scratching post for cats.

About the Author

Dr. Penelope Carbia-Kolevski has been in the aquarium industry for 17 years and has kept a variety of aquariums, including freshwater tropical, Australian native, and African cichlid. She has a masters and PhD in marine ecology, during which she researched how environment shapes fish behavior. To learn more about fish sentience, visit her website at pscarbia.com and search "pscarbia" on Twitter.

As a hobbyist, you've probably noticed learned behavior in your fish. They observe repeated patterns and learn to anticipate them, so here are a few ways you can test their brainpower and provide some enrichment.

Signals

Try using a long, striped piece of PVC pipe in one corner of the tank to signal food arrival. Wait a few seconds, then drop in some food next to it. Be sure to remove the pipe after feeding time, and eventually, you'll have your fish coming over once they see the striped pipe (striped because the jury is still out on color perception in fish, but we know they can distinguish bold striping). After they learn this, you can reverse the training by feeding them at the tank's opposite corner so they have to swim away from the pipe to get food. You can use other signals like turning your air stone off, holding up a striped card on one end of the tank, or putting on the same shirt (preferably patterned) when you approach the tank for feeding time.

Challenges

Don't be afraid to challenge your fish's reasoning ability. Mazes or tunnels are a great way to get your fish to search for a food reward, all for the modest investment in some PVC lengths and elbows. Quick tip: don't bother gluing; that way, you can make a different maze each time! If you're willing to spend a little bit extra, use glass tubes and flexible pipe elbows so you can watch your fish solve the maze.

Another great exercise is to use simple puzzles. Offer your fish two laminated cards, one with a circle and one with a triangle. Designate one to be the reward card. In the first few trials, probably nothing will happen, but you can drop some food near the reward card to get the association going. What you are looking for is that your fish eventually learn to touch the tips of their mouths to the reward card, after which you give them a small reward through a pipette.

Of course, many of these lessons are more manageable when there are only a few fish in your tank, but fish also learn through social mimicry. Only the boldest fish will attempt new and unknown behaviors, but if the others are watching, they can mimic this behavior once they know there's a reward in it for them.


PVC tunnel

Food

This one is a biggie. Pellets are great for giving your fish all the energy they need in a single hit that will take them all of 35 seconds to consume. Not so great for natural behavior. Think about the 80/20 rule: while fish (and most animals) are awake, they spend 80 percent of their time foraging and 20 percent of it resting. In captivity, these numbers are often reversed, leading to stress, unnatural behaviors,

A food reward is given after the puzzle is solved. | Image by lapis2380

and boredom. You can give your fish many different things to keep them occupied, but live food is one of the best solutions to this problem because it forces your fish to engage in natural foraging behavior. For your smaller fish, try *Artemia*, insect larvae, and live worms (if your filtration can handle it, of course).

You can put live blackworms into a cone feeder so your fish can slurp them out at their leisure and entertain themselves for hours. If some fall into the gravel, fret not! Some fish will forage for them as they would in nature by moving the stones around and sucking the worms out like spaghetti. Some will swim over the gravel and feel the worm's movement through their barbels, like your *Corydoras* and Pictus Cats. Keep in mind that such high-calorie/protein food should be made the only meal for the day, so be sure to choose small-holed cones or even DIY sinking toys to make the game last longer.

Live *Artemia* is a great swimming treat that can enhance your fish's stimulation. Newly hatched *Artemia*, or nauplii, use their yolk reserves until their first molt at about 8 to 10 hours. Feeding them to your juvenile or small fish before this is ideal for maximizing nutritional value. Within 48 hours of hatching, they've doubled their size and are no longer carrying around the nutritious yolk. As filter feeders, though, they can consume a range of liquid foods before their introduction into your home aquarium. Even without high nutritional value, they're excellent entertainment and relatively low cost, whether you hatch them yourself or purchase them from your local store. *Artemia* will not survive long in fresh water, so take care not to overfeed your tank with them.

Make your fish really hunt for food like they would in the wild! Are you keeping much larger fish? Try crayfish, glass shrimp, earthworms, mealworms, crickets, or insect larvae. Let's not forget veggies, either. Attaching vegetables to natural driftwood is a great way to encourage natural foraging behaviors, especially for your algae or wood eaters. You can throw in some sliced-up, low-waste veggies, too, like cucumber or zucchini.

Change It Up!

Don't be afraid to rearrange your tank decor; half the fun of keeping an aquarium is aquascaping and trying new layouts. Believe it or not, your fish's brains will benefit, too, because they will have to learn the layout of a new environment, which stimulates parts of the brain that are less active in familiar surroundings. You can make less dramatic changes by rotating through a series of aquarium decorations monthly. Consider throwing in some (safe) foreign objects, like Lego pieces or children's toys, to change up their surroundings. Keep an eye on which fish approach new or changed objects first. Chances are it will always be the same individual(s). These are your bold fellows. If there are some that hang back or don't interact at all, these are your shy individuals, and they are simply making different, conscious choices about taking risks.

Mirrors are another great tool. However, it hasn't been formally proven whether fish have a sense of self. Propping a mirror up for them to investigate themselves does wonders for stimulation, as do images of similar individuals.

Keep in mind that enrichment, by its very definition, is not meant to be done in the same way, at the same time, or even every day; think of it as a treat. These ideas should be used frequently enough to induce learning (repeated behavior) but not so frequently that it becomes routine.

Fish deserve much more credit than they're given when it comes to their complexity. Consider using some of these ideas to challenge them and admire just how much and quickly they can learn! AH

A mirror can be used to stimulate a betta to flare its gills. | Image by kaewphoto

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THE CHARCUTERIE WIGGLERS

By Jason Morin

When I started this scape, I wanted to create something that was Goldfish friendly but also aesthetically designed. I had never seen a fully planted Goldfish tank, and I was determined to make it work. I was used to keeping high-tech tanks but wanted to try a low-tech setup with easy plants. I knew my plant choices would be limited by keeping fancy Goldfish. Large round stones with cascading driftwood and grass-like plants were my focus. I tried smaller plants in the foreground, but the more I added, the less I liked my layout. I decided to pare everything back to my original idea with two main clumps of grassy-looking plants. Stones were placed strategically so there would always be an open area between the two clumps of greenery. Most of the plants I used spread via runners, so stones were used to help control a lot of that spread.

Throughout my time in this hobby, I have always gravitated toward fish with personality, and Goldfish have plenty. I also wanted to prove that Goldfish can be kept in planted tanks. The plants I chose keep up with the waste produced by the fish, and the nitrates are stable at around 5 ppm. A lot of hobbyists turn their noses up at Goldfish, but they are beautiful, full of personality, and sure to put a smile on your face. I named all my fish after foods you'd find on a charcuterie board. Brie, Fig, Olive, Cashew, and Walnut are their names!

About the Author

Jason Morin is a hobbyist from Barrie, Ontario, who has been keeping aquariums for 16 years. He is a professional editor/designer and can be found on Instagram by searching "tanknut."

Aquarium

Tank: Seapora Crystal Series
Dimensions: 36″ × 18″ × 18″
Glass: low iron
Volume: 48 gallons
Cabinet: Aquatlantis Elegance

Thai Oranda (Brie)

Ranchu (Olive)

Thai Oranda (Fig)

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Aquascape

Substrate: CaribSea Super Naturals Torpedo Beach, CaribSea Super Naturals Blue Ridge
Stone: river stone
Wood: eucalyptus
Other: botanicals, shells

Equipment

Lighting: Chihiros WRGB II SLIM90
Photoperiod: 8 hours
Filter: Eheim Pro 4+ 600
Filter Media: Seachem Matrix
Heating: Eheim Thermocontrol-e

Maintenance

Water Changes: 50 percent weekly
Fertilizers: 1:1 mix of 2Hr Aquarist Zero and Complete (5 mL/day)
Other: each fish receives a 15-minute salt bath monthly

Feeding

I feed a varied diet daily. Items may include frozen peas, Hikari Spirulina Brine Shrimp, Saki-Hikari Fancy Goldfish, NorthFin Goldfish Formula, NorthFin Veggie Formula, and Omega One Goldfish Pellets.

Water Parameters

Temperature: ~77° F
pH: 8.0
Ammonia: 0 ppm
Nitrite: 0 ppm
Nitrate: 5 ppm

Plants

- Giant Hairgrass
- Giant Val
- Torta Val
- *Sagittaria subulata*
- *Cryptocoryne balansae*
- Amazon Frogbit

Fish

- (3) Thai Oranda Goldfish
- (2) Ranchu Goldfish
- (1) bristlenose pleco

Invertebrates

- nerite snails AH


Thai Oranda (Brie)

Ranchu (Olive)

The Unlikeliest Biotope: Firemouths and Sailfins

By David Nørholm

About the Author

David is from Mariager, Denmark, and is a teacher at a boarding school. He's been "nerding" since 2014 but bought his first tank in 2006. To see more of David's work, look up "northfish_biotope" on Instagram.

Keeping Firemouth Cichlids (*Thorichthys meeki*) and Giant Sailfin Mollies (*Poecilia velifera*) in the same tank may sound like an insanely risky idea, and it's probably something I never would have believed possible if not for the fact that they coexist in nature. This realization set me off on a quest to create the unlikeliest biotope.

Firemouth Cichlid flaring its gills

Giant Sailfin Molly displaying its beautiful sailfin

The concept for this tank started when I was browsing YouTube a couple of years ago. I stumbled across a video of Giant Sailfin Mollies from a Mexican cenote and was blown away by the beauty of these fish. As a somewhat experienced aquarist, I knew of the widespread commercially bred types, which are often found in local aquarium stores, but I had never seen the wild type. As a sidenote, it is still a mystery to me why this fish is so popular in black, white, orange, etc. and almost never sold in its original yellow-blue wild-type colors. After seeing that YouTube video, I instantly knew I needed to keep these fish at some point.

A couple of years down the line, I was starting to prepare for a Central American biotope and knew it was time to try the wild-type Giant Sailfin Molly. The only problem was finding some suitable tank mates. As an aquarist, my main interest is cichlids. I wanted to find some cichlids to keep alongside the mollies. There were two main requirements for the cichlid species: they needed to be able to live alongside the mollies in the aquarium and they needed to coexist with them somewhere in nature as well. As I was searching for the right species, I kept coming back to the Firemouth Cichlid. I really love this cichlid, and having kept it a few years back, I knew this flashy species was hardy. But did the Firemouth Cichlid occur anywhere in nature in the same habitat with these mollies, and if so, would they tolerate the mollies in the close confines of an aquarium?

To my knowledge, Giant Sailfin Mollies and Firemouth Cichlids were both found in Mexico, but I was not able to find any proof that they were living side by side in the same river or cenote. This was a problem for me since I wanted to create an accurate biotope. Eventually, I found some documents reporting that there are rivers where both species coexist, which was also supported by my local aquarium contacts in Mexico. Now I just needed to find somewhere to buy the wild-type Giant Sailfin Molly. This was surprisingly difficult, given the primary focus on commercially bred types.

The next step was to scape the aquarium. The tank is a 118-gallon Juwel aquarium, measuring 60″ × 20″ × 26″. I am using a 48″ plant light rated at 6,900 K and 90 lumens, a 48″ white/blue plant light rated at 13,000 K and 95 lumens, and a Lumax LED fixture. The filtration for this tank is a bit different than most tanks. I am using a module filter, which is a big internal filter by RockZolid. The module is simply filled with filter media and driven by a Hydor Pico 1150 pump. It is a kind of internal canister filter that is highly decorative. The filter is the big stone on the left side of the tank.

The filter is hidden inside the large stone pictured on the left.


Firemouth Cichlids are only moderately aggressive.


Male Firemouth Cichlids display excellent color.

For the tank's decor, I was inspired by underwater photos I found of the location and some of the tanks assembled by Central American biotope expert Lee Nuttall. The area I am trying to replicate is dominated by roots, fallen logs, leaves, and branches. There is sporadic vegetation, which I also tried to recreate by using biotope-specific plants. The plants I used are *Egeria densa*, *Ceratophyllum demersum*, *Ludwigia repens*, and *Salvinia auriculata*. The wood I chose includes a mix of classic mangroves and Redmoor root, along with some driftwood I found a couple of years ago on the banks of my local inlet. In addition to these, I used other types of locally collected botanicals to make it look more like a natural river bottom.

When I finally introduced the two fish species to the tank, I was a bit nervous. The Firemouth Cichlid has a bad reputation and is sometimes considered more aggressive than it really is. I was mostly

Giant Sailfin Mollies are livebearers and will breed easily in an aquarium.

The natural color of a Giant Sailfin Molly is sublime.

concerned about them fin-nipping the mollies since I was lucky to find a group of well-sized Meekis. But my worry was unfounded because there has not been any kind of aggression between the two species. The Firemouth Cichlids primarily stay in the area around the biggest roots and driftwood, while the Giant Sailfins use the upper water level and open space in the front part of the aquarium. Firemouth Cichlids can certainly be aggressive, but it is mostly during breeding or when they are settling territorial disputes, and this is only toward conspecifics.

To my surprise, the only aggression I observed was between two male Giant Sailfin Mollies. I bought three males and five females, but unfortunately, one of the smaller males became highly aggressive toward both males and females. This was obviously stressful for all the mollies. I decided to move the bully to a quarantine tank

Firemouth Cichlids and Giant Sailfin Mollies coexist peacefully in this biotope.

so the biggest male could establish himself as the alpha. A couple of weeks later, I moved the smaller male back to the main tank, at which point the biggest male dominated the smaller one, just as I had hoped. In the meantime, I discovered that peace and harmony can get pretty boring. Without some competition and rivalry, the Giant Sailfin Mollies didn't display their beautiful sails.

Firemouth Cichlids are really one of the all-time classics when it comes to cichlids in the hobby. If you grab an aquarium book from the '70s, you will almost certainly find a Firemouth Cichlid in it, and it's easy to understand why. These fish are colorful, are easy to breed, and can be kept in relatively small aquariums. I would advise all aquarists to keep this fish at least once in their lives. Besides their beauty, these fish also display very interesting behavior. I love to see them push each other aside without touching each other. It is almost like a dance. I often witness two of my pairs dancing, pushing, and moving forward and back in front of each other. At other times, as when one of the pairs is breeding, both parents protect their eggs or fry by puffing out their big red cheeks, which looks amazing. Meekis are easy to breed in the aquarium, so it is quite possible for anyone to experience this.

One of the only Firemouth-related challenges I have experienced with this setup is the dynamics of the group of Meekis. I have six of them, and that is about the minimum number of individuals needed to experience the full personalities of these fish. In my 118-gallon aquarium, the six fish have divided into two pairs and two lonely individuals. Sometimes, the two lonely fish are harassed by the others and need to hide in the shadows of the tank. That is never pleasant to watch, but it is also a part of nature and is never dangerously aggressive. On other occasions—during feedings, for example—all six individuals can be seen searching for food together as a group. The joy of keeping these fish is found not just from keeping them in a suitable tank but in a tank that is large enough to see their natural behavior, both as individuals and as a group.

This project, a biotope aquarium with *Thorichthys meeki* and *Poecilia velifera*, is one of the most pleasant I have engaged in. It is so interesting to watch both the graceful Giant Sailfins and the charming Firemouths together in one tank. Both species are beautiful, and their behavior is amazing. You may have never considered this seemingly unlikely biotope tank, but these fish fit perfectly together in a dedicated aquarium. AH

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Sifted organic potting soil


Aqua soil (Fluval Stratum)

Choosing the Perfect Nanoscape Substrate

By Connor Donaghy

Like many, when I started in this hobby, I kept fish-only tanks. I had always admired planted aquariums from afar but assumed they were too much work to set up and maintain. That was until I discovered the book *Ecology of the Planted Aquarium*. The author, Diana Walstad, discussed a simple and easy way to keep plants alive and thriving. She mentioned the use of small volumes of water, such as in fishbowls, to conduct tests on small-scale systems that could thrive for months or even years. I thought this method presented a perfect opportunity to get my hands on a few plants and see how green my thumb was. I brought together a few items in a small 3-gallon fishbowl, used a common 13-watt CFL bulb screwed into a desk lamp, and let it rock to see how things progressed. To my surprise, by following Walstad's simple instructions, I soon had a beautiful thriving ecosystem with very little effort on my end. However, after caring for this bowl for a few months, I noticed some drawbacks to the Walstad Method. I went on to research and devise my own experiments to come up with a more suitable substrate for my needs and the needs of my plants, fish, and microfauna. I know I haven't broken any new ground here, but I'd like to share with you the characteristics of a few different substrate options to help you decide which one might work best for your next nanoscape.

About the Author

Connor is a chef from Perkiomen, Pennsylvania. He has been in the hobby for 4 years, mostly keeping Goldfish, but has a major passion for plants and all things nature. His goal is to show people how simple it is to keep beautiful low-tech planted aquariums and inspire them to try it for themselves. Look up "cd_natureprojects" on Instagram to see more of Connor's scapes.

Inert pea gravel

Crushed lava rock

Before I get into the variety of available substrates, let me first talk about nanoscapes for a minute and discuss why I think everyone in the hobby should own at least one. One of the biggest draws of nanos, especially for beginners, is the initial setup cost, which is much lower than an average aquascape. Everything needed to set up a nanoscape, such as plants, hardscape materials, and even the amount of substrate required, is used in much smaller quantities, which lowers the total cost of the entire project. Also, the maintenance sessions everyone dreads are very quick on nanoscapes. Cleaning the glass, trimming the plants, and a decent water change will only take 20–30 minutes of your afternoon, leaving the rest of the day to sit back and admire your nano tank. Lastly, nanos are so special and close to my heart because they can be placed almost anywhere. If a surface can hold the combined weight of the tank, water, aquascape, and its inhabitants, it can be your next nano site. You could have a nano on your bedroom nightstand, kitchen counter, office desk, or anywhere else you like. You can put your own little happy place anywhere!

Formulating a solid plan is the most important step in the whole aquascaping process. What would you like the end result to look like? Do you want carpeting plants? Would you prefer to have a stem-heavy, Dutch-inspired scape? You could even try using a single focal plant in the center, such as a Red Rubin Sword, with small accent plants around it. Depending on what your goals are, you can then decide what substrate system would work best for you. So let's get into that substrate selection, shall we?

I feel it's only right to discuss the Walstad Method first since it was my introduction to the world of aquascaping. The Walstad Method is a very simple concept with some major benefits and a few drawbacks. The idea behind it is to use sifted organic potting soil at a depth of an inch or so, capped with an inert gravel of an equal (or greater) depth to keep the potting soil down, as well as to create a more aesthetically pleasing look. You then plant through the gravel/cosmetic layer into the soil/nutrient layer, allowing the plants to thrive from the start and have more than enough nutrients to stay healthy. This method works great for multiple reasons. First, the potting soil

Plants thriving in a Walstad bowl

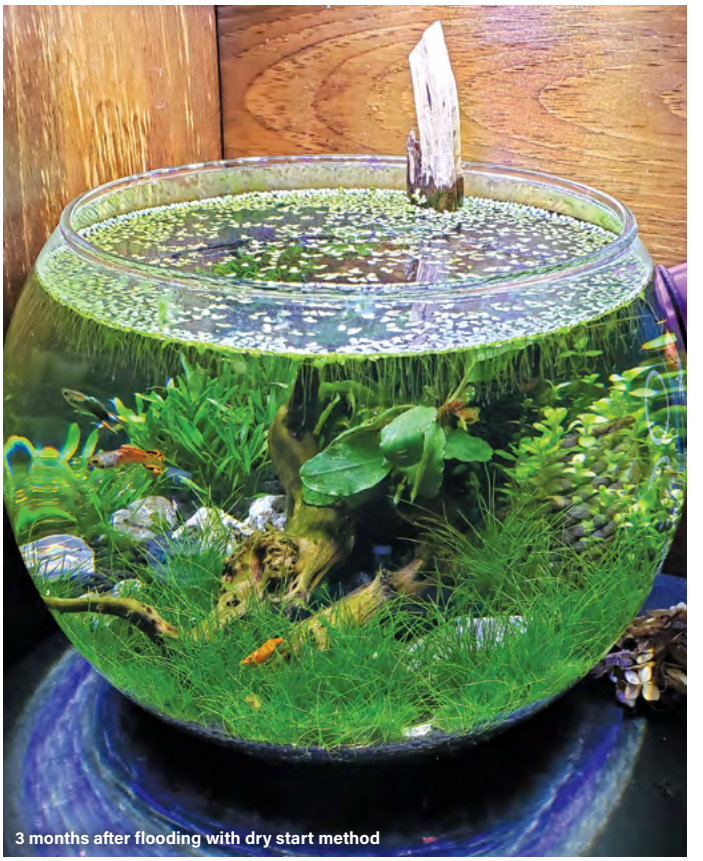
brings with it nitrifying bacteria, so the nanoscape will instantly be cycled with the addition of the soil, allowing you to stock fauna the same day you set it up. This is almost unheard of in the aquascaping game. It also supplies massive amounts of nutrients to the roots of your plants, allowing you to focus on other aspects of the scape instead of worrying about nutrient supply.

One major drawback, and the reason I've moved away from this method, is that replanting or removing any of the plants in the scape results in pulling dirt up along with the roots. This causes clouding of the water and unleashes excessive nutrients into the water column, leading to algae blooms. Second, potting soil, after a few weeks in your scape, can produce a gnarly smell that you'll be trying to track down for weeks, only to find it's seeping from the heart of your little aquascape. After dealing with these problems, I did some research to look for a better way to achieve the same results without the drawbacks.

As a beginner aquascaper, I spent a lot of time watching international aquascaping videos on the internet for inspiration, tips, and a deeper understanding of this beautiful hobby. Doing so, I found most aquascapers were using a product called aqua soil, something I was not familiar with.

After additional research, I discovered Fluval Stratum, a product I would consider a solid, basic aqua soil. It's nothing special, but at the same time, it's very special to me. It provides essential nutrients for plant growth while retaining the solid shape of a sphere. It doesn't smell bad or cloud the water like potting soil, and it won't cling to

Dry start method with tissue cultures and Fluval Stratum



3 months after flooding with dry start method

Floating plants offer many benefits in filterless nano bowls.

Neocaridina shrimp are some of my favorite creatures for nanoscapes.

Seachem Flourish Tabs (root tabs)

roots and cause major problems when you decide to relocate or replace your plants. Aqua soil also has the advantages of looking great and being packed with nutrients, meaning it can be your go-to choice for carpeting plants, like the ever-popular dwarf hairgrass. Aqua soil can also soften your water slightly and encourage a neutral to slightly acidic pH. These water parameters are more ideal for aquatic plants as well as invertebrates like *Neocaridina* shrimp. One of the major downfalls of using aqua soil is that, upon initial setup and flooding of the aquascape, it releases excess nutrients, creating an ammonia spike. This in turn requires an initial series of large water changes to achieve the balance that all ecosystems need. Aqua soil also doesn't contain the nitrifying bacteria present in potting soil, so an instantly cycled aquascape won't be achieved with this method. Currently, there are quite a few choices for aqua soils available in the market.

The last method I'd like to mention is the use of inert gravels with the addition of root tabs and liquid fertilizers. In my experience, this method results in the slowest plant growth, but it has a few benefits. These fertilizers can be added to an aquarium that's not planted but already set up. In this scenario, you can drain half the water out of your old tank, arrange a grid of root tabs where you'd like to plant a few stem plants or root-feeding plants, and plant away. Top off the tank, add a few squirts of liquid fertilizer, and you'll have a planted aquarium in one afternoon.

All the methods discussed have distinct advantages and disadvantages. The Walstad Method is likely best for heavy root feeders and people who don't move plants frequently. The aqua soil method might be preferable for those who plan to relocate plants, change their scapes, or desire the full-carpet look. Lastly, the root tabs and liquid fertilizer method is recommended for those who don't want tons of maintenance trimming plants or don't want to start from scratch to add a few stems to an old fish tank. If I were to suggest only one substrate system for your next nano build, I'd have to recommend the use of aqua soil with the addition of a crushed lava rock base. Crushed lava rock, with its porous nature, supports a lot of beneficial bacteria and acts as an effective growing medium for the base of your plants' roots. I use lava rock to build height in my nano bowls and then use aqua soil as the cosmetic and nutrient layer. This cuts down on overall costs by using less aqua soil, which can be fairly expensive, while the lava rock, if purchased from a hardware store, can be very cheap. If you use this method, keep in mind the initial ammonia spike and prepare for it. If you also add a few root tabs in the lava rock layer, I can almost assure you of success with your scape. Remember to have fun, make your own happy place, and make things you love. **AH**

Nanoscape using CaribSea Eco-Complete, root tabs, and liquid fertilizer

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ISLAND UNDER THE SUN

By Quentin Charpentier

This aquascape was inspired by Asian pot ponds. While traveling in Indonesia and Thailand, I've always been amazed by the big ceramic pots full of water where mollies and Guppies thrive. Whether near a temple or at a road junction, you can see these ponds literally everywhere in some countries in Asia.

It's very common to see water lilies growing and flowering in these same pots, even under only 4 to 6 inches of water. Seeing them flourishing and blooming in these shallow displays is a beautiful sight. For a complete disclosure on my obsession with this plant, you can read my article in the Q4 2021 issue of *AHM*.

These days, shallow tanks are definitely a trend, and I can easily understand why. They're pushing aquascaping to another level. It's not only about having an aquarium. With the emersed part of the tank, it's more like having a slice of nature in your living room.

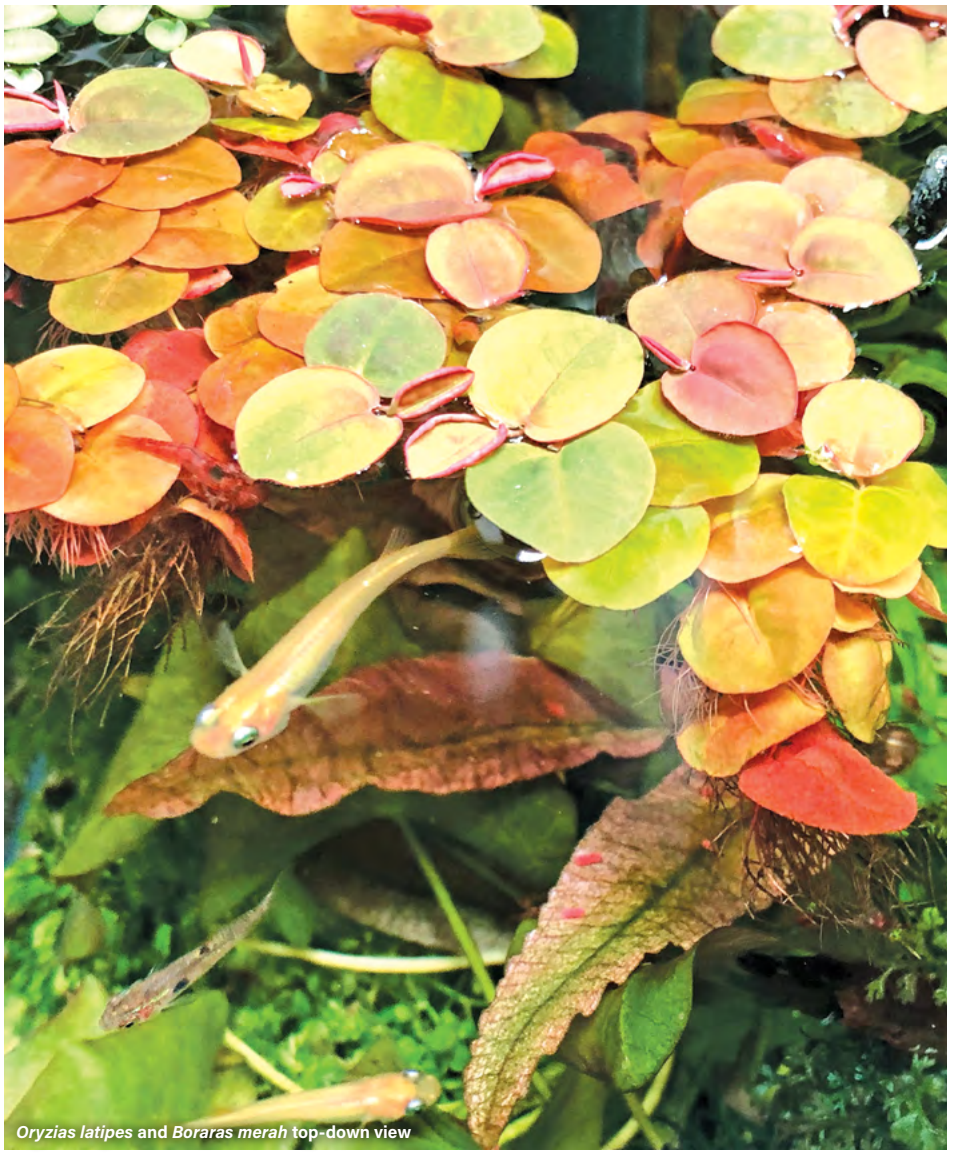
About the Author

Quentin is a casting director from Paris, France, who started keeping aquariums at the age of 13. He had been out of the hobby for 12 years until one day, he found a nano tank in the street. Now, scape after scape, layout after layout, he's sharing everything he can on social media. To see more of his work, follow "ParisianScape" on Instagram.

Hardscape before planting

I've tried different things in the upper part of this scape, such as switching plants from grasses to carnivorous plants. And I have to say, it's pure joy for the eyes every single time. A few months ago, I even planted a sensitive plant (*Mimosa pudica*) directly into this wet environment, and it's been a success. The plant is growing vigorously, and I have trimmed it several times already.

The big piece of wood is a great memento for me. I found it with my dad at the age of 15 while trekking by a lake. I had left it forgotten in my dad's garage until I rediscovered it last year. Nothing is really lost or found; it's all about transformation.



***Oryzias latipes* and *Boraras merah* top-down view**

Aquarium

Tank: AquaDesigner
Dimensions: 24″ × 12″ × 7″
Glass: Optiwhite
Volume: 8.5 gallons

Aquascape

Substrate: Tropica, ADA La Plata Sand
Stone: lava stones
Wood: unknown species for the big piece, river wood, Senggani roots

Equipment

Lighting: Chihiros WRGB II
Photoperiod: 8 hours
Filter: JBL CristalProfi e702 greenline
Filter Pipes: glass inflow and outflow
Heating: NEWA Therm Preset 25° C

Maintenance

Water Changes: 30 percent weekly with reverse osmosis water
Fertilizers: Grotech NutriPlant 1 (every 3 days)
Feeding: frozen food (red worms, *Artemia*) 3 times a week, Tropical Soft Line America and OASE Organix every other day

Plants

- *Acorus gramineus* 'Variegatus'
- *Bolbitis heteroclita* 'Difformis'
- *Bolbitis heudelotii*
- *Bucephalandra* sp. 'Deep Purple'
- *Cryptocoryne wendtii* 'Flamingo'
- *Drosera aliciae*
- *Eleocharis acicularis*
- *Hydrocotyle tripartita*
- *Microsorum pteropus* 'Trident'
- *Micranthemum* sp. 'Monte Carlo'
- *Nesaea pedicellata* 'Golden'
- *Phyllanthus fluitans*
- *Salvinia natans*
- *Sarracenia* sp.
- *Staurogyne* sp. 'Porto Velho'

Fish

- *Oryzias latipes*
- *Boraras merah*
- *Corydoras pygmaeus*

Invertebrates

- *Clithon corona*
- *Caridina multidentata*
- *Neocaridina davidi* (Red Rili) AH

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Islands of Green

By James Anemone

Lately, I've been reading books by Takashi Amano, like *The Art of Nature Aquarium, Nature Aquarium Complete Works*, and *Origin of Creation*. Although it's easy to find inspiration in any of his works, I was most drawn to those at Sumida Aquarium in Tokyo, as well as his personal home aquarium. These aquariums are the epitome of Amano's legacy, as well as some of the best examples of the aquascaping hobby.

Previously, I was keeping aquariums with many fast-growing, colorful stem plants. I loved the contrast and variety in colors and texture, and I also enjoyed the feeling of immediate success at seeing the plants grow quickly. However, maintenance became quite intense, and I'd find myself spending hours trimming and replanting stems on a regular basis.

The plan for this aquarium was to try a different spectrum of plants, particularly Java Ferns, *Bolbitis heudelotii*, and other slow growers. Also, I abstained from using different colors of plants, instead deciding on green plants only. I used a lot of hardscape materials, well over 50 pounds of Seiryu Stone and many intertwined pieces of branch wood. After some improvisation, the layout became a double island with an open area in the center. Separating the islands is ADA La Plata Sand, as well as smaller pieces of Seiryu Stone to act as a transition. Although this aquarium has only been running for about 4 months, the plants have grown in quicker than I anticipated, and most of the hardscape is already covered in plant growth.

There are several challenges to maintaining this aquarium. The *Eleocharis vivipara* in the background grows very quickly and requires frequent trimming, and the sand substrate needs maintenance on a weekly basis. The sand tends to grow green algae rather quickly, and removing dark pieces of soil from the sand becomes a chore. If stirring the sand to reveal clean surface sand doesn't work, I replace old sand with new, fresh sand. Aside from this, the rest of the aquarium is quite standard and doesn't have any specialized requirements. It is an aquascape that could in theory be low tech but reaches its maximum potential with intensive lighting and CO_2 injection. Although it will never be comparable to the masterpieces of Takashi Amano, I'm proud to be one of the thousands of torchbearers of his traditional Nature Aquarium style.

AQUARIUM

Tank: ADA Cube Garden 120P
Dimensions: 48″ × 20″ × 20″
Glass: ultra-high clarity
Volume: 80 gallons
Cabinet: Archaea wood cabinet

AQUASCAPE

Substrate: Fluval Stratum, ADA La Plata Sand
Stone: Seiryu Stone
Wood: branch wood

About the Author

James entered the aquarium hobby in 2018 and has been aquascaping and keeping high-tech planted aquariums since 2020. He is a classical pianist and teacher from West Chester, Pennsylvania, and can be found on Instagram and YouTube under the name "anemoneaquascapegallery."


Boesemani Rainbowfish


Firehead Tetras and Boesemani Rainbowfish

EQUIPMENT

Lighting: (2) UNS Titan 1 LED
Photoperiod: 8 hours
Filter: OASE BioMaster Thermo 600, Fluval 206 canister filter
Filter Media: Seachem Matrix, sponge
Plumbing: JARDLI 17 mm glass lily pipes, ADA 17 mm clear hose
CO_2: 5 lb tank, ADA Pollen Glass Beetle

MAINTENANCE

Water Changes: 50 percent weekly
Fertilizers: NilocG Thrive+ (all in one)

PLANTS

- *Anubias barteri*
- *Bolbitis heudelotii*
- *Bolbitis* sp. 'Difformis'
- *Bucephalandra* spp.
- *Eleocharis vivipara*
- *Hygrophila pinnatifida*
- *Microsorum pteropus* 'Needle Leaf'
- *Microsorum pteropus* 'Trident'
- *Riccardia chamedryfolia*
- *Taxiphyllum barbieri*

FISH

- Firehead Tetras (*Hemigrammus bleheri*)
- Boesemani Rainbowfish (*Melanotaenia boesemani*)
- Pearl Gourami (*Trichopodus leerii*)

INVERTEBRATES

- *Caridina multidentata*
- *Neocaridina davidi* (yellow)
- *Neritina natalensis* AH

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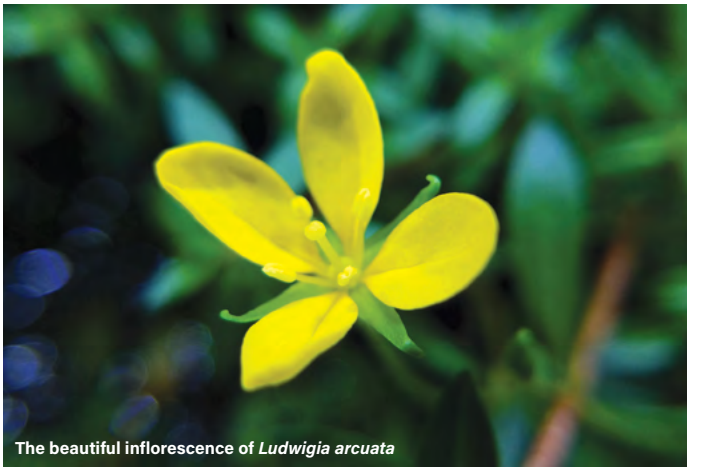
Ludwigia arcuata in its submerged form

This *Ludwigia arcuata* flower is ready to bloom.

Ludwigia arcuata grows deeper red under strong light.



The beautiful inflorescence of *Ludwigia arcuata*

PLANT SPOTLIGHT: *Ludwigia arcuata*

By Mridul Singh

About the Author

Mridul lives in Rockville, Maryland, and got his start in the hobby when he went to his local pet store for birdseed 12 years ago and won a 55-gallon tank. He's been all in ever since. Search "MridulSinghMusicalTanks" on YouTube to listen to his music and see his plants and fish.

The perennial *Ludwigia arcuata* is a fairly common orange-red aquarium stem plant. The intense reds this plant can offer are mainly achieved when grown in aquariums with supplemental CO_2, although in this article I will be talking about how *L. arcuata* grows in a tank without CO_2 injection and how it can still achieve decent coloration.

L. arcuata is native to the southeastern United States (especially in Florida's central panhandle and northern/central peninsula) and is found mostly in marshes and around the margins of lakes and ponds.

In a tank without any supplemental CO_2, older leaves will be green, and the leaves closer to the top of the stem will have an intense orange to red color. The stems range from green to deep reddish brown. *L. arcuata* has thin stems and therefore is quite fragile.

Even in tanks without CO_2 injection, *L. arcuata* can grow to the surface of the water and then continue growing. I have planted stems of this plant in one corner of my 29-gallon tank that have grown all the way across the length of the tank before curling back again.

L. arcuata can be used as a midground plant in most tanks, creating a hedge next to hardscape, or behind green carpeting plants such as dwarf hairgrass or *Lobelia cardinalis* 'Mini'. In larger tanks with substrate mounds toward the back, you can use this plant at the very back to create depth.

WATER PARAMETERS

I like to keep this plant at a pH of 6.8–7.4. My water temperature fluctuates between 76 and 78° F, although *L. arcuata* can grow in a very wide temperature range, from the mid-60s all the way to 79° F.

LIGHTING

Lighting for the tank is provided by two Nicrew lights, with the blue LEDs covered to prevent algae. I have found that under medium light, the plant will turn orange, and under higher light, it will turn redder, even without CO_2. In fact, this plant is doing exceptionally well in my tank where I don't add any CO_2.

PROPAGATION

This *Ludwigia* species, like most other species in the genus, is very easy to propagate. Side shoots will naturally grow from each lower node (where a leaf meets the stem, more accurately, the meristem). However, if I want more of this plant quickly, I trim off the tops of the stems (leaving 2–3 nodes on the original plant) and replant the tops.

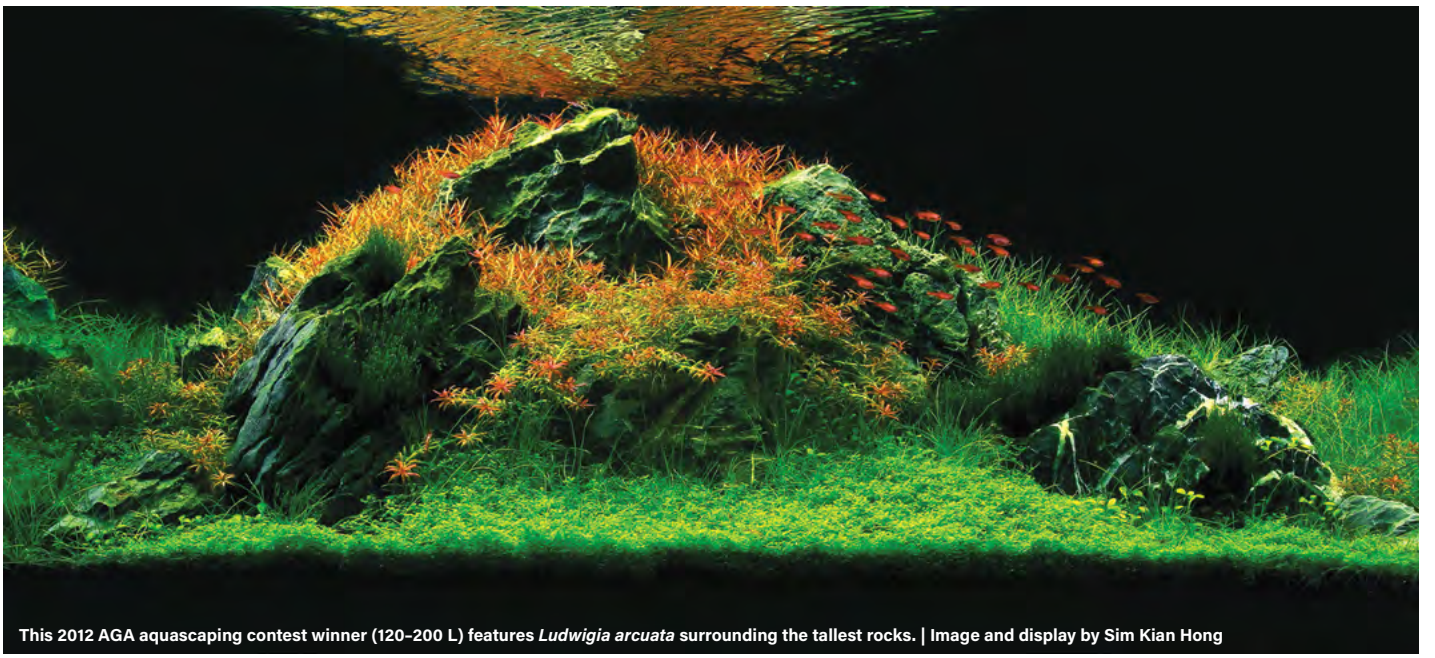
When grown under medium light, *Ludwigia arcuata* has an orange coloration.

In time, I will have three plants—two new shoots from the original stem plus the top that I replanted.

EMERSED GROWTH

L. arcuata is easy to grow emersed, and most of the time, you will receive this plant in its emersed state. The emersed growth is drastically different, looking much like rosemary in leaf shape and size. Depending on the level of light, the stem will be a deep red or green. In the spring and summer months, *L. arcuata* creates the most beautiful yellow four-petaled flowers. Provide a cover for your emersed *L. arcuata* to maintain higher levels of humidity. This plant will grow very fast when emersed, so it can take over quickly if not pruned regularly.

This versatile plant is easy to grow and even in a low-tech tank can be very showy. If you haven't grown it before, give it a try! AH



This 2012 AGA aquascaping contest winner (120–200 L) features *Ludwigia arcuata* surrounding the tallest rocks. | Image and display by Sim Kian Hong

RADICAL RAINBOWS

By Gregg Zydeck

Native to Australia and New Guinea, rainbowfish can be found in a wide variety of shapes, sizes, and colors. While most people have only seen a couple of the common varieties in their local fish store, there are dozens of species available.

Rainbowfish are peaceful, colorful, active, easy to care for, and long lived. As juveniles, they can easily be overlooked. Many start out rather drab, and they are slow growers that take years to fully mature. However, if you have patience, a tank full of mature adult rainbowfish is one of the hobby's most colorful displays.

For many years, I kept easy-to-grow plants that only required low light, such as crypts, swords, and ferns. About 4 years ago, I decided to take things a step further and venture into the world of plants that require higher light levels. This meant lots of new equipment and lots to learn. I spent hours studying the methods of successful hobbyists, which to me was time well spent.

To be able to control every water parameter, I installed a reverse osmosis (RO) system and holding tanks for the RO water. RO is a water purification process that uses a semipermeable membrane to remove ions, unwanted molecules, and larger particles. RO water

About the Author

Gregg lives in Novi, Michigan, with his wonderful wife of 28 years and enjoys cooking and golf when he's not sharing his knowledge on plants and rainbowfish. He has been in the hobby on and off for 4 decades and is active in the rainbowfish community, having worked with most of the well-known breeders. To learn more about his system, plants, and fish, search "Greggz" on plantedtank.net.

has no general hardness (GH) or carbonate hardness (KH). The first step in preparing the RO water for use is to remineralize it to achieve my target parameters. To restore general hardness to the RO water, I dose it with calcium sulfate ($CaSO_4$) and magnesium sulfate ($MgSO_4$). I also restore a small amount of carbonate hardness using potassium carbonate (K_2CO_3).

In addition to dosing the RO water for hardness, I also add macronutrients (the main nutrients needed for healthy plant growth) into the RO water holding tanks. I add nutrients until I reach a target of 24 ppm nitrate, 9 ppm phosphate, and 36 ppm potassium. For micronutrients (nutrients that plants need in trace amounts), I create my own custom-blended solution based on 11 percent iron DTPA (diethylenetriaminepentaacetic acid), which is a source of iron for plants grown in alkaline conditions. I purchase all macros and micros as dry fertilizers so that I can more precisely control the ratio of each nutrient and dose daily.

My filtration consists of two Rena Filstar XP Ls and one Rena Filstar XP XL. The two XP Ls return water via spray bars. They are aimed up toward the surface to create constant surface agitation, which provides a good level of dissolved oxygen for the rainbows.

The XP XL drives a 20" Cerges CO_2 reactor. The CO_2 is supplied from a 10-pound tank with a GLA PRO-series CO_2 regulator. The flow is controlled with a Dwyer RMA-151-SSV flowmeter, set to about 50 cc per minute. In addition, I use an American Marine PINPOINT CO_2 controller to drop the pH from 7.05 to 5.70 during the photoperiod.

Lighting is provided by eight T5HO bulbs with high-quality reflectors. The bulbs include ATI Purple Plus, Powerveg 660, Giesemann Tropic, and Giesemann Super Flora. In my experience, the right mix of colorful bulbs helps bring out the best color in both plants and fish. I use a Seneye Reef monitor to measure PAR (photosynthetically active radiation), which is 110 at the substrate.

FISH

- Lake Kurumoi Rainbowfish (*Melanotaenia parva*)
- Painted Rainbowfish (*Melanotaenia picta*)
- Boesemani Rainbowfish Lake Aytinjo (*Melanotaenia boesemani*)
- Turquoise Rainbowfish (*Melanotaenia lacustris*)
- Goyder River Rainbowfish (*Melanotaenia trifasciata*)
- Pappan Creek Rainbowfish (*Melanotaenia trifasciata*)
- Yellow Rainbowfish (*Melanotaenia herbertaxelrodi*)
- Dority Rainbowfish (*Glossolepis dorityi*)
- Albino Millennium Rainbowfish (*Glossolepis pseudoincisus*)
- Sepik Rainbowfish (*Glossolepis multisquamata*)
- Emerald Rainbowfish (*Glossolepis wanamensis*)
- Wapoga River Rainbowfish (*Chilatherina alleni*)


Lake Kurumoi Rainbowfish


Painted Rainbowfish


Boesemani Rainbowfish Lake Aytinjo


Dority Rainbowfish

Turquoise Rainbowfish

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Painted Rainbowfish

Boesemani Rainbowfish Lake Aytinjo

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Yellow Rainbowfish

Ludwigia inclinata var. verticillata 'Pantanal'

Rotala macrandra 'Variegated'

Myriophyllum sp. 'Roraima'

PLANTS

- *Acmella repens*
- *Alternanthera reineckii* 'Variegated'
- *Bacopa* sp. 'Colorata'
- *Barclaya longifolia*
- *Cabomba furcata*
- *Eriocaulon lineare*
- *Hygrophila balsamica*
- *Hygrophila corymbosa* 'Compact'
- *Hyptis laciniata*
- *Lagenandra meeboldii* 'Red'
- *Limnophila chinensis*
- *Lobelia cardinalis* 'Mini'
- *Ludwigia aromatica*
- *Ludwigia* sp. 'Atlantis'
- *Ludwigia inclinata* var. verticillata 'Cuba'
- *Ludwigia inclinata* var. verticillata 'Meta'
- *Ludwigia inclinata* var. verticillata 'Pantanal'
- *Ludwigia ovalis* 'Pink'
- *Ludwigia* sp. 'Mini Super Red'
- *Myriophyllum* sp. 'Roraima'
- *Nymphoides hydrophylla* 'Taiwan'
- *Ottelia ulvifolia*
- *Pogostemon erectus*
- *Rotala macrandra* 'Caterpillar'
- *Rotala macrandra* 'Variegated'
- *Rotala* sp. 'Vietnam'
- *Samolus parviflorus*
- *Syngonanthus* sp. 'Belem'
- *Syngonanthus* sp. 'Meta'
- *Syngonanthus* sp. 'Vichada'
- *Tonina fluviatilis*

The plants I keep are rarely found at my local fish stores. I acquire most from other hobbyists. Much like rainbowfish, there is a wide variety of sizes, shapes, and colors available. My focus now is on combining different species to create a colorful underwater garden, which provides the perfect backdrop for a tank full of colorful rainbowfish. AH

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