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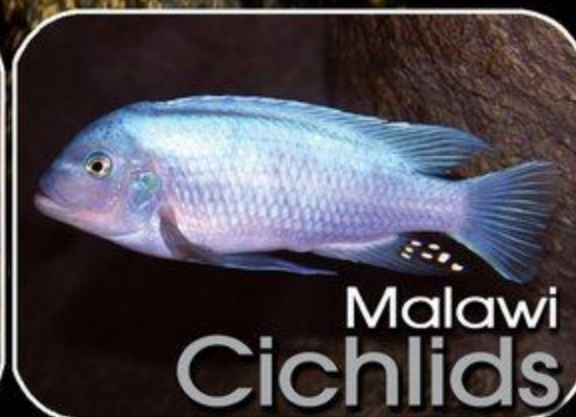
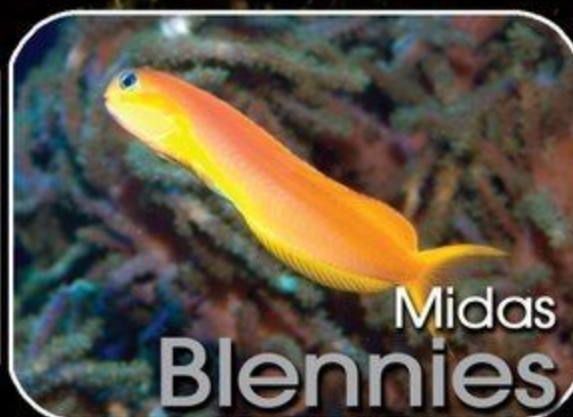
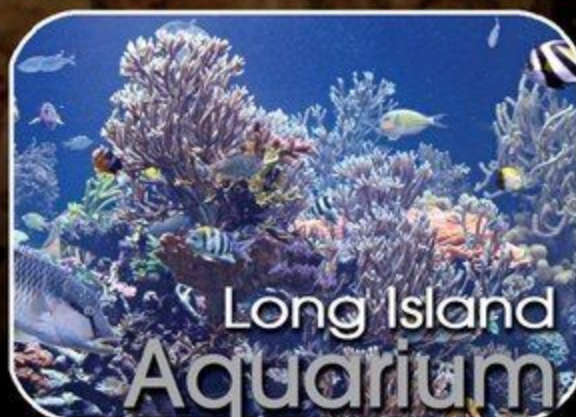
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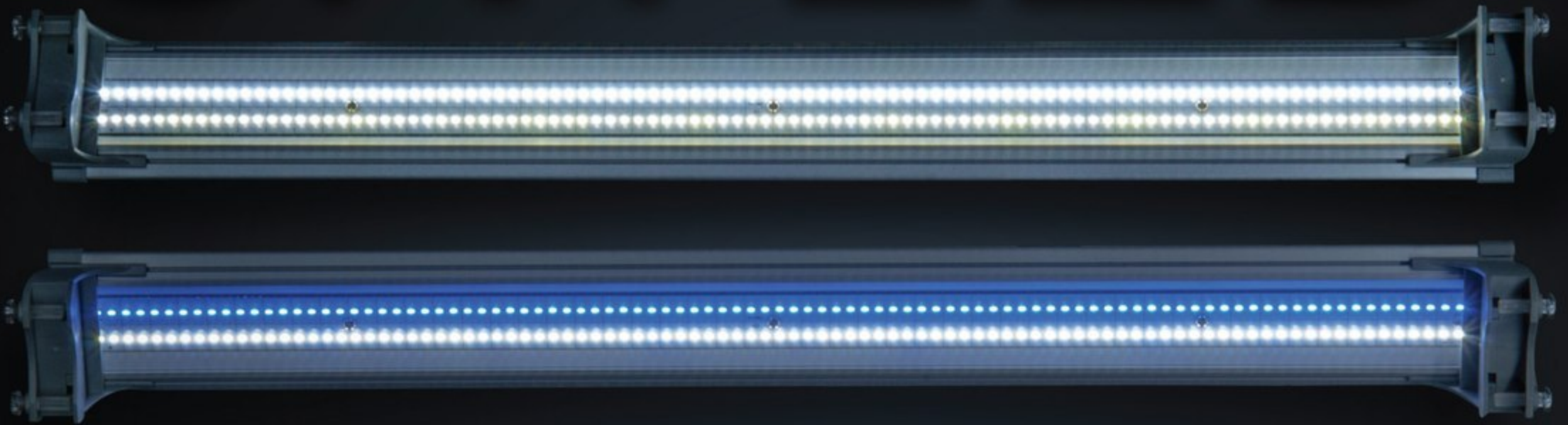


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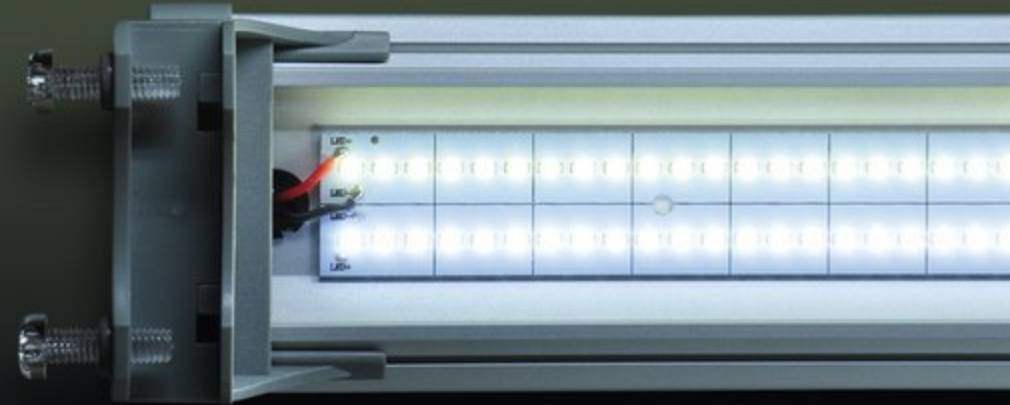
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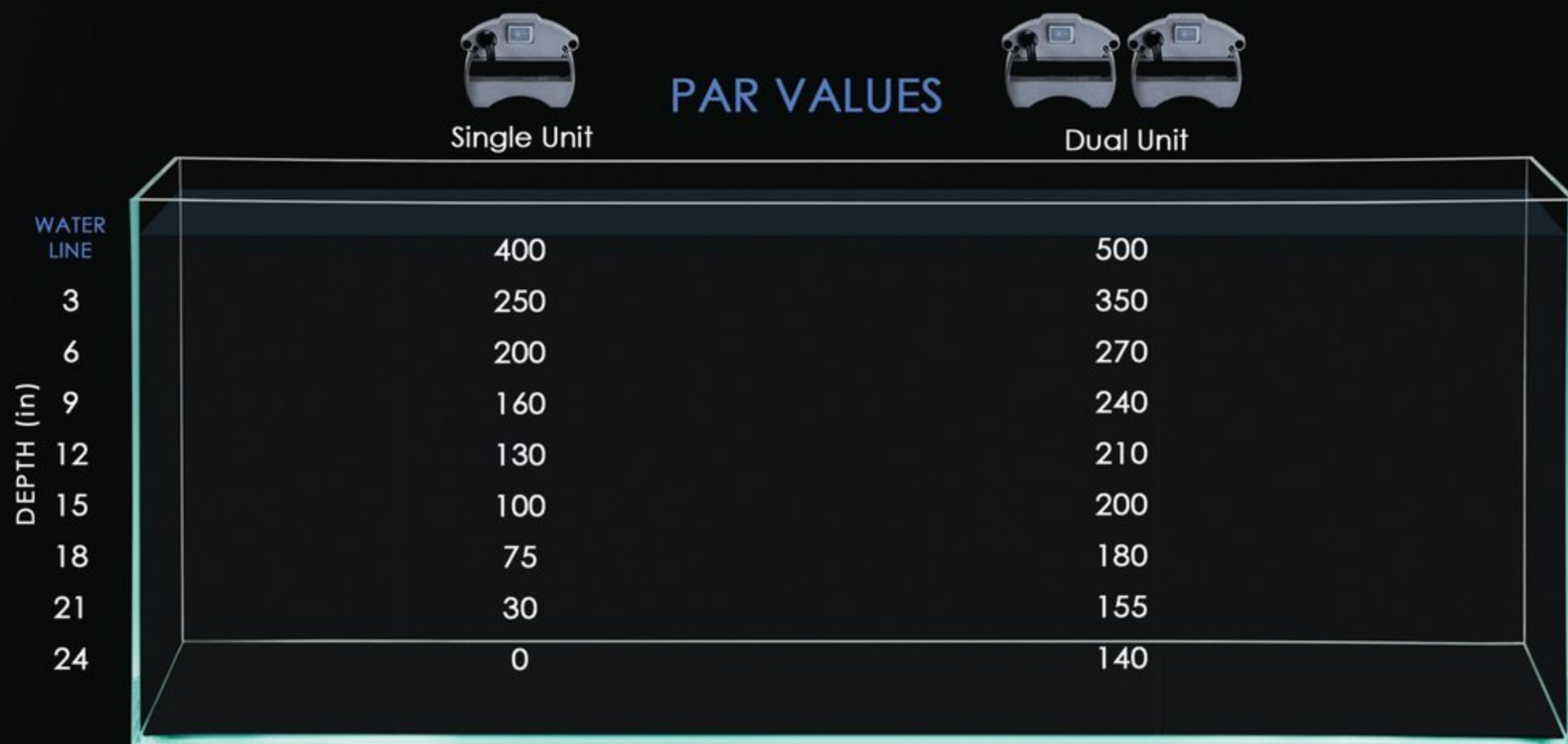
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features

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We are proud to announce the winners of the annual International Aquatic Plants Layout Contest and feature the best aquascapes from around the world. **ADA**
- 70** **Book Excerpt: *Breeding & Raising Angelfishes***
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- 82** **The South American Silver Arowana**
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- 88** **Building a Heron Island Biotope, Part 2: Using Species Characteristics to Create a Biotope**
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- 96** **A Visit to the Long Island Aquarium**
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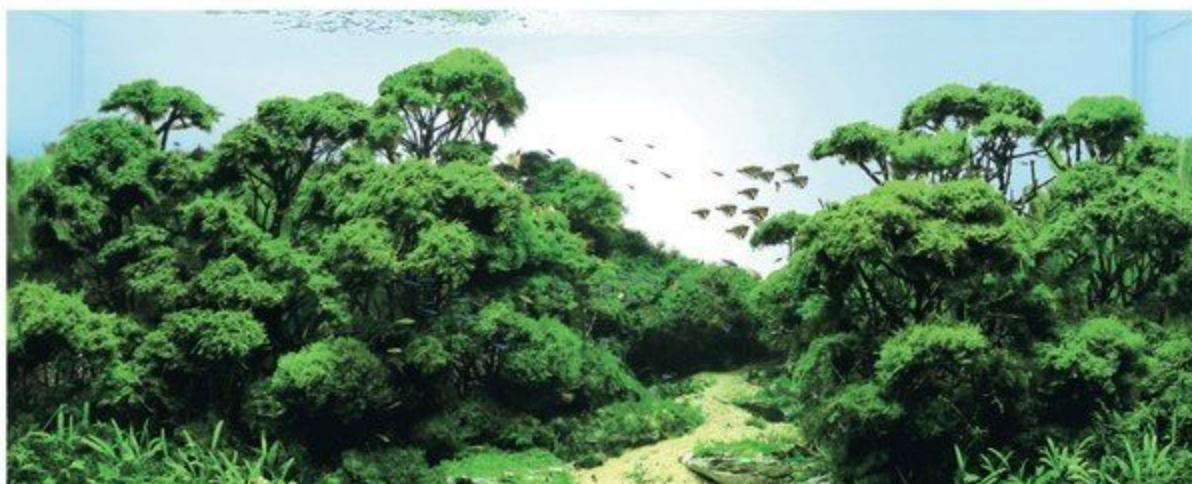


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Beautiful, graceful, and elegant are all words that can be used to describe our iconic cover fish—the South American silver arowana. Although not as revered as its Asian cousins, the South American silver arowana is a regal and fascinating fish, and (unlike the Asian arowanas) you can legally acquire one in the United States. For fans of monster fish, the South American silver arowana can be an excellent choice to put in your pond. Learn more about caring for this gorgeous animal from an expert arowana keeper on p. 82.

Photograph by Hristo Hristov

Our cover photo is available for your wallpaper and/or screensaver in the downloads section of tfhmagazine.com.

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TROPICAL FISH

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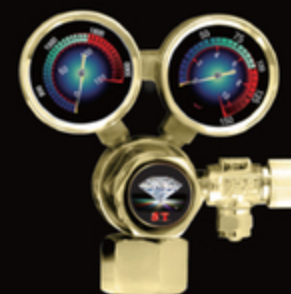
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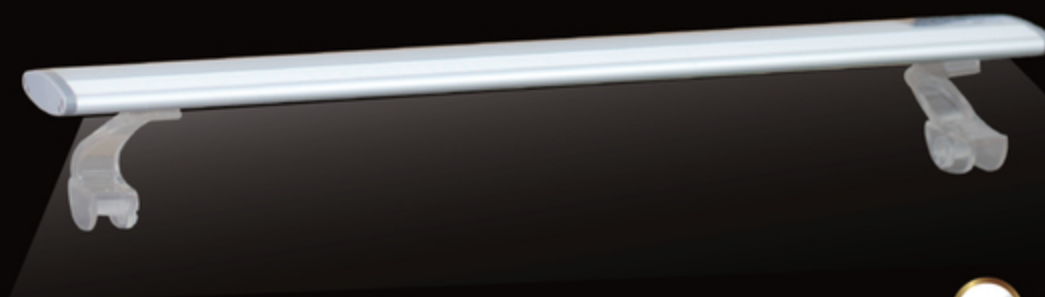


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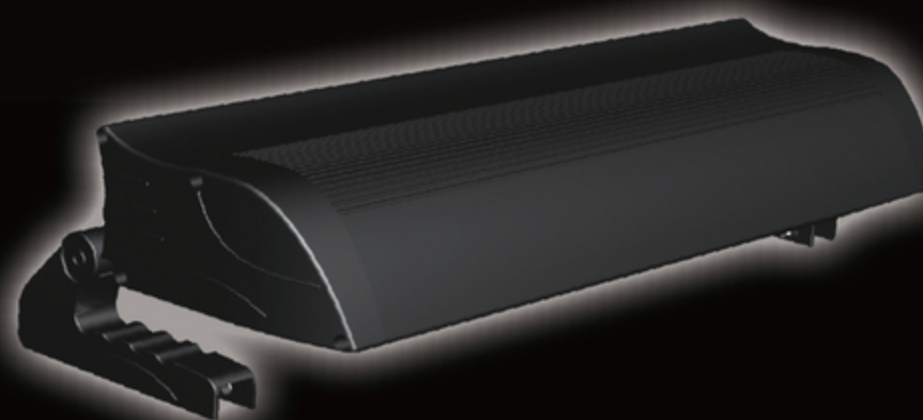


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editor's note



Blake Tedeschi

One thing that never ceases to amaze me is the level of dedication people have in this hobby. Sure, there are plenty of us who set up a display tank in the living room and devote only as much time to it as is necessary, but there are many people who turn fishkeeping from a simple hobby into a lifestyle.

Nothing showcases how people take the hobby to another level better than the annual

International Aquatic Plants Layout Contest held by Aqua Design Amano. These acolytes of Takashi Amano come from countries all over the world, and they design tanks based on his Nature Aquarium style, spending countless hours (and often, quite a few dollars) on their creations, and submitting photos of the finished product to the contest.

This year I was honored to take part in judging the competition for the first time, and I can honestly say that every entry I saw was masterfully done. Picking a favorite was exceptionally difficult, and all of the entrants should be proud of their work. You get a better feeling for just how much time and energy these people put into their tanks this month, as we feature the top 12 layouts from this prestigious competition (p. 66).

Besides spending time on aquascaping, you can put your efforts toward captive breeding of fish, with some people going so far as to develop their own fancy variety. In our exclusive book excerpt of *Breeding and Raising Angelfishes*, author Ed Stansbury breaks down the information on genetics that you would need to start developing an angelfish (or other fancy) strain of your own (p. 70).

Another way to integrate fishkeeping into your lifestyle is to have it take up a large portion of your home. Tobias Lim Koon Li has done just that,

constructing a 13,000-gallon pond that takes up most of his backyard for his monster fish collection. This month he discusses one of his favorites, the South American silver arowana (p. 82). He is so connected to his arowana, dubbed "Big Momma," that he hand feeds it.

The ultimate way to raise fishkeeping up from a hobby is, of course, to make it your job. Aquarist Todd Gardener did just that and now works for the Long Island Aquarium. Among other things, his efforts have led to the first captive-breeding successes with basslets of the genus *Liopropoma*. If you're looking to follow in his path or just want to learn more about the aquarium, you can read Mark Denaro's article on p. 96.

And of course, for those who aren't ready to quit their day job to embark on a fishkeeping career, as always this month we have plenty of articles for all levels of aquarists. To add to our recent series of articles on the veritable rainbow of colors in which fish species can be found, Phil Purser comes through again, providing information on a number of inky black fish that can help add a subtle accent to your community (p. 76). "The Planted Tank" columnist Amanda Wenger argues that some (inevitable) algae can make a valuable addition to your aquascape, while offering invaluable advice on getting rid of the overgrown bits and undesirable forms (p. 38). And on the salty side, expert reefer Scott Michael finishes his Heron Island biotope (p. 88).

No matter how much time you have or want to dedicate to this wonderful hobby, we're dedicated to helping you with it as much as possible.

Shari Horowitz
Managing Editor
Tropical Fish Hobbyist

readers' forum



Facebook Readers Respond: Do you keep aquatic animals other than fish?

My reef tank has hermit crabs, peppermint shrimp, several kinds of snails, coco worms, and a Hawaiian feather duster worm. There are also many amphipods, miscellaneous worms, and other microfauna I intentionally stock. I have five types of coral too.

Greg Revelez

Axolotls, various snails, turtles, and marmorkrebs.

Joel Antkowiak

Snails.

Jason Appel

Turtles and inverts.

Aaron McDonald

Frogs.

Brenna Echterling

I have a 3-gallon red crystal shrimp tank.

Steve Carlson

Frogs and turtles!

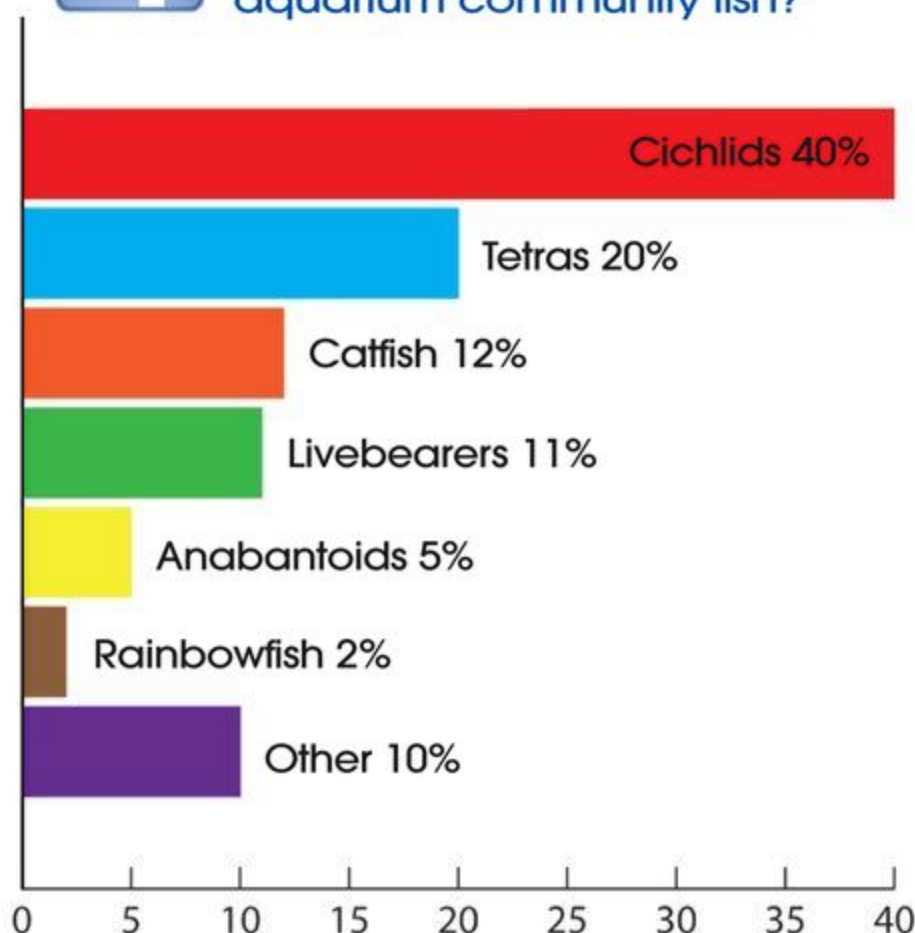
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TFH Facebook Poll

What is your favorite type of freshwater aquarium community fish?



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contributors

In This Issue: "Nature Aquarium is a style based on long-term maintenance. A layout is created by taking the passage of time into consideration and deciding on appropriate aquatic plants and planting spaces. It takes a long time to recreate nature. Being able to enjoy a layout for more than ten years is one of the characteristics of Nature Aquarium."

Other Works: *Nature Aquarium World*, *Aqua Journal*

On Nature Aquarium Trends: "Although it is not surprising from the standpoint of a contest to have a variety of different styles of layouts, there have been a number of diorama-style layouts among the recent entries that were created elaborately with minute details over a relatively short period. I suspect that it is not easy to maintain this type of layout over a long period of time. As I mentioned previously, a natural feel is heightened in a layout by maintaining it over a long period of time, which enables the viewers to feel the atmosphere of *wabi-sabi*. The trend has changed since the inception of the contest, and such works have decreased in numbers in recent years."

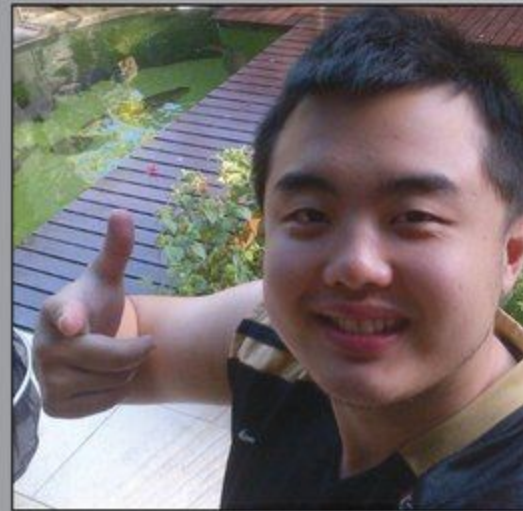


Creating an Unzan-Seki Stone Layout That Can Be Enjoyed for a Long Time
Takashi Amano

takashi
amano



tobias
lim koon li



In This Issue: "I believe that South American silver arowanas are overlooked and undervalued and deserve more attention. Out of all the different types of arowanas, they are the largest and most personable. I felt the need to raise awareness about a wonderful fish that could very well become a lifelong companion for potential aquarists."

Favorite Monster Fish: "Asking me to choose my favorite type of monster fish is like asking a parent to choose between their children. They may not have a definitive answer but can pick out certain traits in each child that they are fond of. I love how my *Arapaima gigas* follow me around the pond, constantly begging for food. I love how all my silver arowanas are tame and can easily be hand fed and petted. I love how my red-tail catfish can be called to the surface of the pond at dinnertime. Out of all my fish, these are the three species that display the most human-interactive behavior. It is only natural that a strong bond has developed between these three species of fish and myself."

In This Issue: "The facility and the staff at the Long Island Aquarium really impressed me. The displays are particularly well done and some of the nicest I've seen, with the 20,000-gallon reef tank being the ultimate showstopper. The work going on behind the scenes is even more impressive. Todd Gardener's successes in captive breeding are paving the way toward the future of the marine aquarium hobby and leading us to a time when a large percentage of the fish being sold will be captive bred."

Owner of: Anubias Design, an aquarium and terrarium design, installation, and maintenance company.

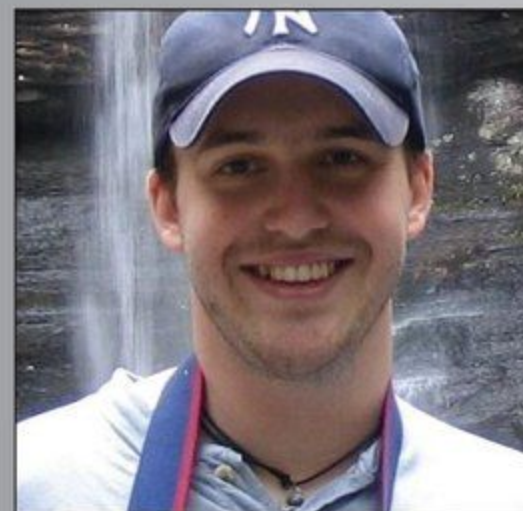
Favorite Fish: "Despite the fact that the labyrinth fish are my true love on the freshwater side of the hobby, my single favorite freshwater fish is the cardinal tetra. Their coloration and schooling behavior combine to make them one of the most ideal aquarium fish. My favorite marine fish is the royal gramma. Their coloration is as spectacular as that of the cardinal tetra, but their social interactions are more complex, adding another level to my fascination with this species."



mark
denaro



phil
purser



In This Issue: "Medieval thought was that black was the total absence of color, but most of us think of black as the darkest color. I think black is very stark, striking, and attractive. Because nature includes black in some of her most alluring fish, I decided on an article on how to incorporate this 'lack of color' in the home aquarium."

Other Works: Many herpetology books, with the most recent being *Good Snake Keeping*, and some marine ichthyology as well, including *Keeping Moray Eels in Aquariums*.

Best Maintenance Advice: "The best piece of maintenance advice I could give a beginner is two-fold: Do not be in too big a hurry to heavily populate your tank, and do not be overly hasty in dumping chemicals into your tank. Populate your tank slowly (maybe one fish every three weeks or so), and search for natural solutions to your water chemistry woes. Also make sure of what species you are considering before you add them to your tank."

also in this issue: Jack Wattley, Eric Hanneman, Amanda Wenger, Mike Tuccinardi, Charles Clapsaddle, James Fatherree, Frank Wazeter, Scott Michael, and Ed Stansbury

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See the Silver Arowana

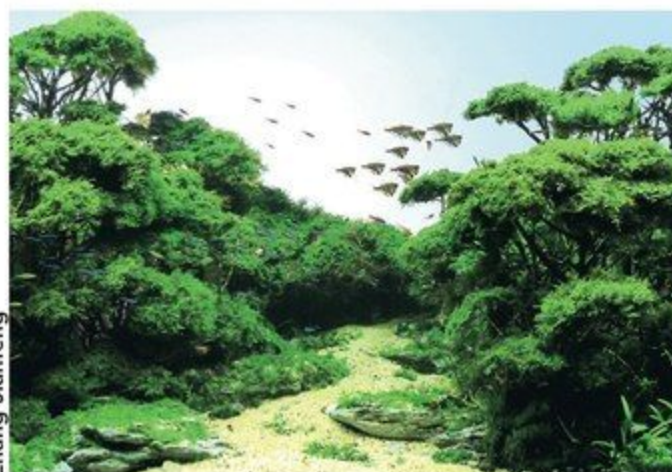
Tobias Lim Koon Li absolutely loves his pet arowanas, especially "Big Momma," a silver arowana he rescued from a fellow hobbyist. After reading all about Big Momma on p. 82, you can visit the Aquatic Videos blog to see her unique behaviors and majestic grace, as well as other monster inhabitants of Tobias' huge pond!



Tobias Lim Koon Li

International Aquatic Plants Layout Contest

Once you check out the top 12 amazing entries in the International Aquatic Plants Layout Contest on p. 66, you are sure to want to see more. With dense forests to open meadows and even mountains, these aquascapes are truly inspirational. Visit the *TFH* Extras blog to see more of these incredible photographs.



Zhang Jianfeng

Visit the Long Island Aquarium

After reading about the Long Island Aquarium on p. 96, you might be excited to see it in person but may not be able to get there easily. *TFH* can help! Visit the Aquatic Videos blog for two videos: one in the aquarium's snorkel tank, and another of the famed 20,000-gallon reef tank. You'll feel like you're right there!



Mark Denaro

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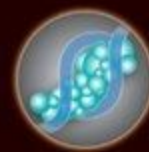

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Rainbow Shark

Having a black, torpedo-shaped body and red tail fin, the rainbow shark (*Epalzeorhynchos frenatus*) is often confused with its close cousin, the red-tail shark (*E. bicolor*). The rainbow, however, can be distinguished by its pectoral, dorsal, and anal fins, which are also bathed in bright crimson. These additional accents make *E. frenatus* the flashier of the two, but the differences between them go beyond simple aesthetics.

Unlike the red-tail shark, the rainbow shark has a much more pleasant attitude and rarely shows signs of hostility or aggressiveness. It can feel compelled at times to nip at the fins of fish with extravagant finnage, but this is easily avoided by keeping them with more active, modestly appendaged tankmates. Being secretive, rainbow sharks also enjoy significant cover, so driftwood, caves, and other areas for



Q&A freshwater

Q Keeping Schwartz's Cory

I'd like to add an interesting bottom-dweller to my 30-gallon freshwater tank, which currently contains 12 neon and 6 pristella tetras, and I'm considering trying Schwartz's cory. Will these species get along together? I keep the water temperature at 76°, and the pH is 7.2. Does this cory have any special needs I should know about?

Dave Hayes
via email

A I think some Schwartz's cory catfish (*Corydoras schwartzi*) would be a great addition to your tank, and they should get along just fine with your neons and pristellas. The water parameters you list are well within the appropriate ranges for this species, so I don't see any problems there. Also, it will readily accept most standard aquarium fare, so it doesn't present any significant feeding challenges either.

Like most cory cats, *C. schwartzi* is a schooling species, so I would recommend adding at least five specimens. To protect those sensitive barbels, the ideal substrate is sand or smooth, fine-grained gravel. Subdued lighting is also preferred, and be sure to provide lots of cover (plants, driftwood, etc.) for the cories to seek refuge in.

Q Ailing Angelfish

I have a pair of marbled angelfish in a 20-gallon tall tank. The tank has been up and running for about a month. Over the past week, the angelfish came down with a disease that I can't identify. There are no white spots, rotted fins, or other obvious physical symptoms. They've just

stopped eating and act very listless. My dealer recommended a tea-tree-oil based medication, and when that didn't work, he suggested a stronger multipurpose medication. That hasn't made a difference either. What do you recommend I do now? I'd hate to lose my angels!

Kenan Norman
via email

A Step one is to stop the use of any medications in your tank! I'm at a loss to figure out why your dealer would suggest two different medications without having any concrete symptoms to base this judgment on. Food refusal and listless behavior in fish can stem from so many different problems that to recommend medications based solely on those symptoms is, in my opinion, irresponsible. Remember, haphazard dosing of medications can do more harm than the "disease" you're actually trying to treat.

Also, are you testing your water quality and chemistry? With this being a newly setup system, I can't rule out the possibility that the tank was not fully cycled before the angelfish were added. In that case, the presence of ammonia or nitrite could very well be causing the problem. Or, it could simply be that your water parameters aren't stable or are out of line for angelfish. Captive-bred angelfish strains can adapt to a wide range of water chemistry values, but they do best in relatively soft, acidic water and won't tolerate extremes or fluctuating values. Also, where are you maintaining the water temperature? Angels like it warm—in the low- to mid-80s—and could very well exhibit the symptoms you describe if kept too cold.

The bottom line here is you need to address any potential environmental issues with your system before resorting to medications. Even

got a question?

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at that, you should medicate only if you can pinpoint the disease you're treating with a reasonable degree of accuracy. At the very least, you need to test the ammonia, nitrite, nitrate, and pH levels to make sure they're all at safe levels. Copious water changes (possibly coupled with activated carbon use) will eliminate any residual medication as well as dilute any dissolved pollutants that might be causing or contributing to the problem.

Q What's in a (Nick)Name?

In researching the fishes of Lake Malawi, I came across an interesting, attractive species called the Malawi eye-biter. Does this fish really do what its common name implies?

Jeanne Rodgers
via email

A Assuming you're referring to *Dimidiochromis compressiceps*, I think it's safe to say (with apologies to Mark Twain) that reports of this species' eye-biting behavior have been greatly exaggerated. Precisely where this moniker came from is not entirely clear, but it doesn't seem to have much factual basis. At least, there aren't many hobbyist reports that support the notion that this behavior is commonplace with captive specimens. In nature, *D. compressiceps* is an ambush predator of small fishes, which it swallows whole. Now, could it be that *D. compressiceps*' intended prey items sometimes lose an eye but escape with their lives or that territorial squabbling results in a tankmate getting its eye poked out? Either situation is certainly a possibility. But I don't think the evidence really supports the use of the common name "eye-biter."

Perhaps David Boruchowitz explains it best in his *Guide to Cichlids* (T.F.H. Publications, 2006) when he writes, "Although there are some conflicting reports, it is unlikely that this nickname has any validity. Loss of an eye in cichlid aggression is not uncommon in captivity, and in such a case, it makes no sense to pin this reputation on an entire species."

Q No Need to Cycle From Scratch

I will soon be upgrading my 20-gallon freshwater community tank to a 40-gallon to give my fish more swimming space. I'll also be moving the aquarium to a



■ Like most cory cats, Schwartz's cory catfish (*Corydoras schwanzi*) is a schooling species that should be kept in groups.



■ Despite what its name might suggest, the Malawi eye-biter is a predator that is more likely to be found swallowing prey whole.

different room of the house. Is it likely I'll need to cycle the tank all over again after the move?

Lee Otis
via email

A You shouldn't have to cycle the tank from scratch again, but some disruption to your biological filter is inevitable. However, there are steps you can take to minimize this disruption. First, make sure your new tank is in place, leveled, and ready to receive the contents of the old one before shutting systems down. You're going to need additional substrate to cover the bottom of the larger tank, so that should be in place ahead of time, too. Also, be sure to have on hand plenty of dechlorinated/dechloraminated water that

has been heated to match the temperature in your aquarium. Heavy-duty plastic storage bins are ideal for this purpose.

Once you're confident the new tank is ready, siphon some water from your old aquarium into a bucket or other container and transfer the fish to this temporary holding vessel. Then, promptly transfer the substrate (this should be placed on top of the new substrate material in the 40-gallon); any rocks, driftwood, plants, or other décor; and as much of the old water as possible. Top off the tank with the clean, heated water you prepared ahead of time. Finally, you can transfer the fish to their new home.

If you move swiftly enough, a significant portion of the nitrifying bacteria colonies inhabiting your substrate and other objects should survive the transition. Plus, the greatly



Stan Sung

■ While they are not related, bluegills share certain traits with cichlids, such as taking care of their eggs and fry.

increased water volume will be a big help in diluting any ammonia or nitrite that might crop up with the biofilter somewhat compromised. Still, you'll want to test your water daily to monitor for the presence of these compounds, and you should be ready to perform copious water changes in the event one of them spikes.

Q Are Bluegills Cichlids?

I'm a long-time fisherman, and I've caught a lot of bluegills in various lakes over the years. A friend of mine recently told me that bluegills are actually cichlids. Is that true?

Ross Mallory
Fort Wayne, Indiana

A I'm afraid your friend is incorrect. While both the North American sunfishes, including the bluegills (*Lepomis macrochirus*), and the cichlids are members of the order Perciformes, they diverge from one another after that. The sunfishes belong to the family Centrarchidae, while the cichlids belong to the family Cichlidae. Thus, bluegills and other sunfishes are centrarchids, not cichlids.

That being said, there are similarities between the sunfishes and certain cichlids. For instance, male sunfishes dig breeding pits in the substrate like some cichlids do. Also, most sunfishes (the males of the species anyway) provide parental protection of the eggs and fry, which one could argue is very cichlid-like behavior. Furthermore, male sunfishes can be explosively aggressive in defense of their territory—an attribute very familiar to many cichlid aficionados.

Q Giraffe in a Smaller Package

Is there such thing as a dwarf giraffe catfish? I found some for sale online, but I've never heard of them before. I know the regular giraffe catfish

gets over 2 feet long, which is way too big for my 75-gallon tank. If there's a dwarf version of the species, though, I think it might do okay in my tank.

Bernie Selman
Cleveland, Ohio

A I wouldn't exactly say there's a dwarf version of the giraffe catfish (presumably *Auchenoglanis occidentalis*). There is, however, a distinct species, *Anaspidoglanis macrostoma*, that is often assigned the common name "dwarf giraffe catfish." Though both species are from Africa and arguably very similar in appearance, *A. occidentalis* can grow to exceed 2 feet while *A. macrostoma* reaches a total length of just under 10 inches. Thus, your 75-gallon tank should provide suitably sized housing for a single specimen of *A. macrostoma*.

It's also worth noting that these two species have somewhat different feeding habits. *A. occidentalis* is omnivorous, feeding on plankton, mollusks, seeds, and detritus, while *A. macrostoma* is more carnivorous, feeding on insect larvae, crustaceans, and small fish (source: FishBase). Be sure to house *A. macrostoma* only with species too large to be swallowed (probably good advice for *A. occidentalis*, too).

Q Sightless but Still Snippy

I bought five blind cave tetras (*Astyanax jordani*, I believe) to put in with my swordtails after being told they're generally peaceful and do well in the same type of water. I must have gotten an especially aggressive batch because they've shredded my swordtails' fins. Have you ever heard of this happening with this species? By the way, since they're blind, how on earth do they even figure out where the other fish are to nip their fins?

Neil Holman
San Jose, California

A Believe it or not, blind cave tetras are rather notorious fin nippers, though for some reason, they're commonly described as peaceful community-tank inhabitants. While they lack eyes, these tetras have a great sense of smell and taste and exceptional spatial perception provided by the lateral line, so their blindness is no impediment to finding food or detecting intruders/competitors.

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In fact, they've been known to actually outcompete sighted tankmates at feeding time! I suppose it stands to reason that when you live in a pitch-black cave where eyesight is of no utility, other senses would have to "pick up the slack" to allow for effective food acquisition, territorial defense, etc.

Q Who's Eating My Neons?

I have a 55-gallon freshwater tank that until recently contained 25 neon tetras, 5 angelfish, and a black ghost knifefish. I say "until recently" because seven of my neons have disappeared over the past few weeks. They'll be there at night when I go to bed but then gone in the morning when I turn the lights on. I assume they're getting eaten, but who do you suppose is doing it, the angelfish or the black ghost knifefish? I asked my dealer what he thinks, and he said it's probably the angelfish because the knifefish eats only insect larvae. Then again, my angelfish are still pretty small, so I'm not so sure he's right.

Brandon Syracuse
via email



TFH Archives

■ The black ghost knifefish prefers to sift through substrate for edible food items, but it is not above consuming smaller tankmates.

A I wouldn't be as quick as your dealer to rule out the black ghost knifefish (*Apteronotus albifrons*) as the culprit. It's true that insect larvae are included in this species' diet, but that's not all it eats. Other small invertebrates and small fish, such as your neons, are on its menu as well. Also, *A. albifrons* is a nocturnal feeder, so the

fact that the alleged victims are vanishing overnight sort of points another finger of blame at the ghost knife. Can angelfish eat neons? If they're large enough, sure. But since, as you point out, the angels are still pretty small and the nocturnal disappearances fit the modus operandi of *A. albifrons*, I think we can probably rule out the angels.



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Q Getting Re-acclimated

After introducing a guppy with velvet to my community tank and losing all my fish, I am now a convert to the practice of quarantining all new specimens. I recently bought some platies, and they've successfully completed a four-week quarantine period (no signs of velvet or other sickness—whew!). Am I right in assuming I can put them directly in the display tank without acclimating them again, since the water in both tanks is from the same source and is heated to the same temperature?

Jason Cook
via email

A First let me congratulate you on your conversion to quarantining. I, too, learned the vital importance of this practice the hard way (but with saltwater fish)—and it's a lesson I've never forgotten. Now to your question: Though your quarantine and display tanks are both filled with the same source water and heated to the same temperature, I would recommend acclimating your new specimens again nonetheless. There are likely to be subtle differences in water chemistry

and quality between an established aquarium and a quarantine system that has been up and running for only a matter of weeks.

Assuming testing reveals that the water parameters are nearly identical between the two systems, all you really need to do is transfer the specimens and some water from the quarantine tank to a bucket or other rigid container. Then, replace 25 percent of the water in the container with water from the display tank. Repeat this step every 10 minutes or so. After about a half hour of this process, the fish should be ready to be released into their new home.

Q Green Water Problems

I'm having a persistent problem with green water in my freshwater aquarium. My dealer told me the green color is caused by algae and the best way to get it under control is to increase my water changes, which I've done. But the problem isn't going away. It seems to get better immediately after a water change, but then it gradually turns back into pea soup, even if I change almost all the water. What can I do to clear up my water once and for all?

Maryanne Green
Frisco, Texas

A It's apparent the water changes are temporarily correcting the symptom of green water but not addressing the underlying source of the problem.

Green water arises when excess dissolved nutrients are present in the system and act as fertilizer for free-floating algae, so you'll need to figure out where these nutrients are coming from. You didn't mention anything about the size of your tank, the livestock in it, or what and how much you're feeding, but green water is often a problem in tanks that are overstocked, undersized for their inhabitants, or overfed (or any combination of these three). So, your first step is to evaluate the bioload in your system and make any necessary adjustments (removing specimens, cutting back on feeding, etc.). Beyond that, check your filter media, as they may be clogged and in need of a good rinsing or replacing, and give your substrate a deep vacuuming (assuming it's gravel and not fine sand) to eliminate decomposing detritus that may have settled there. If a fish, snail, or other organism has been unaccounted for lately, be sure to check all the corners, nooks, and crannies in the tank for its decomposing body. You might also need to test the nitrate and phosphate levels of your tap water to rule out the possibility the dissolved nutrients are being replenished with each water change. 🐟

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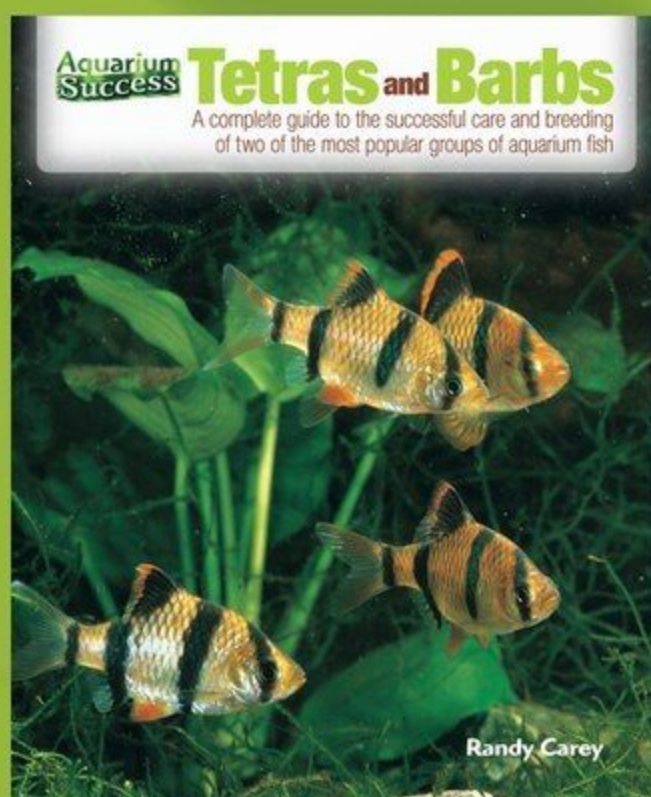


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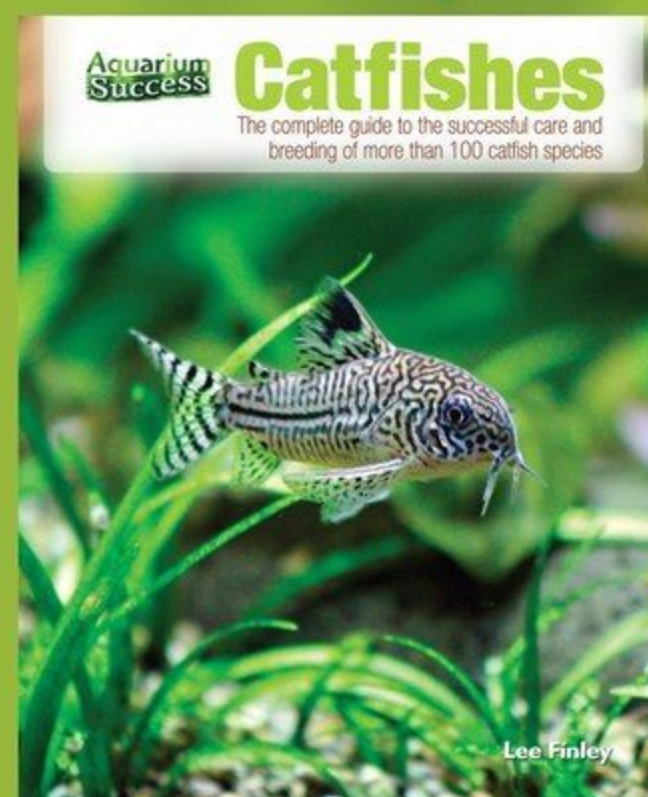
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Q&A saltwater

Q No Taste for *Aiptasia*

My 40-gallon reef tank is in the midst of a glass anemone outbreak, and I recently added five peppermint shrimp to eat them. The trouble is, they aren't taking any interest in them. In fact, the population of these anemones is actually growing. I'm certain I have the species of peppermint shrimp known to eat these anemones—*Lysmata wurdemanni*. My dealer confirmed the identification, and they look exactly like every photo I've ever seen of *L. wurdemanni*. Do you think the problem could be that the shrimp are filling up on fish food and therefore not interested in eating the anemones?

Jeffrey Baird
via email

A *L. wurdemanni* is known to eat glass anemones (*Aiptasia* spp.), but like any animal introduced to an aquarium for the express purpose of eliminating a pest organism, it's not completely dependable in this regard. In other words, its *Aiptasia*-eating tendencies may vary from one specimen to another. Depending on which hobbyist you ask, these shrimps will make quick work of *Aiptasia*, eat some but not all of them, or ignore them completely. I think there's some merit to your line of reasoning that the shrimp are getting more than enough to eat from the fish's leftovers and, therefore, aren't particularly tempted by the *Aiptasia*. You might try feeding the fish very sparingly, making sure that nothing is left uneaten, to see if the shrimp will then take an interest in the *Aiptasia*.

Q Sunrise & Sunset in the Reef Tank

I'm a beginner reefkeeper, and I always seem to have more questions than answers. One very basic question I hope you don't mind answering pertains to the lighting schedule. Does it matter whether you time the lights to match the normal day/night cycle, or can you set them to turn on and off whenever it's most convenient for viewing? I don't get home from work until late evening, and it would be nice to have a little time to relax in front of my tank while the lights are still on.

Rachel Gaffney
via email

A Your question may be basic, but I'm sure there are a lot of other first-time reefkeepers out there with the same question in mind, so thank you for asking it. No, it's not necessary to schedule your reef lighting to coincide with the natural day/night cycle. As long as the lights are on for somewhere between 10 and 12 hours per day, it really doesn't matter precisely when that photoperiod is provided. (Consistency is important, however, so make sure the lights are on for the same 10- to 12-hour period every day.) Many hobbyists who keep reef systems time their lights to be on when they're home and can enjoy viewing them.

Q A Reef-Safe Triggerfish?

The dealer at my local fish store says the sargassum triggerfish can be safely added to a reef tank. What's your opinion on that?

Joe Donovan
via email

got a question?

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A Adding a sargassum triggerfish (*Xanthichthys ringens*) to a reef aquarium would not be my first choice. This species is technically reef-safe in the sense that it generally won't nibble on corals and other sessile invertebrates, but I wouldn't trust one around crustaceans or other motile invertebrates that are often included in reef systems (think cleanup crews). Plus, *X. ringens* reaches a fairly respectable size—approximately 10 inches—and demands multiple feedings throughout the day. In my book, these characteristics are a recipe for future water-quality problems, which you definitely want to discourage in a reef system.

Q Calcium on a Nano Scale

What's the best way to supplement calcium and alkalinity in a 20-gallon nano reef? The tank is still in the planning stage, and at this time, I'm leaning toward keeping only soft corals (though I might change my mind).

Timothy Schuster
Jacksonville, Florida

A If you stick with your plan of keeping only soft corals, which don't have a particularly high calcium demand, you should be able to maintain appropriate calcium and alkalinity levels in such a small system strictly through frequent partial water changes. However, be sure to test your calcium and alkalinity regularly because the system's demand may change over time as the corals grow. If you observe that happening or decide to go with "calcium-hungry" stony corals instead of softies, you can always incorporate an additional form of supplementation, such as one of the two-part (calcium/alkalinity) supplements formulated specifically for nano tanks or one of the nano-sized calcium reactors on the market.

Q Preventing the Dreaded Salt Creep

Is there anything I can do to prevent salt creep from building up on every surface around my aquarium? I even have glass covers over the tank, but the salt still manages to work its way around them somehow.

Kyle Nowak
South Bend, Indiana



Bob Fenner

■ Peppermint shrimp (*Lysmata wurdemanni*) may fail to consume pest anemones if there is some other, more easily accessible food source available.



Brian Lasenby/Shutterstock

■ A messy eater that reaches a length of 10 inches, the sargassum triggerfish is rarely appropriate for a reef aquarium.

A I'm afraid there's not really anything you can do to prevent salt creep entirely. Salt creep occurs anywhere surface turbulence (produced by filter returns, powerheads, airstones, bubble wands, etc.) causes salt water to splash out of the tank and onto surfaces and objects exposed to air. The water then evaporates, leaving behind the salt crystals. Eliminating surface turbulence would seem to be the obvious solution to the problem, but doing so would also reduce vital gas exchange in the system.

I find the best way to manage salt creep is to frequently run a slightly damp cloth over the surfaces that are subject to it—before the salt builds up to an unmanageable level. If you do this often enough, the chore is no more taxing than dusting a bookshelf. Keep a close eye on any power cords extending from the tank, as salt creep can travel down them

and potentially reach a power outlet (though a proper drip loop in the cord should prevent this). Of course, you would want to use a dry cloth when cleaning electrical cords.

Q Opercular Spine Defined

I was doing some online reading about the coral beauty angelfish and discovered this species has sharp opercular spines. Are these spines located in the dorsal fin, and do they pose a threat to people?

Justin Parsons
Tucson, Arizona

A Opercular spines are present not just on the coral beauty (*Centropyge bispinosus*), but on most angelfish species. And no, these backward-curving spines are not

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Commonly sold as the chevron butterflyfish, *Chaetodon trifascialis* is an obligate corallivore that almost never survives in the aquarium.

located in the dorsal fin, but on the lower rear margin of the gill covers, or opercula (plural for operculum). You may need to look closely to spot them, as on *C. bispinosus*, they tend to blend in with the color of the body. These spines can lacerate skin (and feisty tankmates), so it's a good idea to exercise caution when capturing/transporting angelfish or working in an aquarium containing one. However, I've kept several coral beauties over the years, and none has ever aggressively attacked my hand. A more common problem is getting those sharp spines snagged in nets or having them slice through shipping bags. Hence, it's best to herd angelfish into a rigid container when capturing them and to double bag them for transport.

Q Chevron Butterflyfish

Does the chevron butterflyfish usually do well in captivity, and is it easy to feed? My dealer has a nice, healthy-looking specimen for sale at a good price, and I'm planning to buy it for my 125-gallon if it turns out to be a good option.

William Heinschel
via email

A Kudos to you for inquiring about the specimen before buying it! In this particular case, depending on which species it turns out to be, I think you might be glad you did. Most likely, the butterflyfish you saw is *Chaetodon trifascialis*, the species most commonly sold as the chevron butterflyfish. If that's the case, I would resist the urge to buy that nice, healthy-looking specimen because it won't stay healthy for long. *C. trifascialis* is an

obligate corallivore that feeds on the polyps and mucus of certain stony corals. So, unless you're willing to provide a steady supply of live *Acropora* corals for your specimen to feed upon, it won't live long in your tank.

Now, you might also see other butterflyfish species sold under the common name chevron butterflyfish. For example, *Chaetodon xanthurus*, which is often sold as the pearlscale or yellowtail butterflyfish, is sometimes labeled the Philippine chevron butterflyfish. This species, though not particularly easy to keep, has a much better captive survival record than *C. trifascialis*, is not an obligate corallivore, and can usually be encouraged to accept a variety of meaty aquarium fare.

I would recommend getting your hands on a good aquarium reference book or two and positively identifying the fish in question. Then you should be able to make a sound, informed decision.

Q Glass Cover Conundrum

I have a 55-gallon reef tank, and I recently purchased a new light fixture containing two 150-watt metal halide bulbs, four 54-watt actinic T5 tubes, and LED moonlights. The fixture is suspended 8 inches above the tank and is equipped with a protective lens. Is this lens adequate to protect the fixture against saltwater splashes, or would you recommend also putting a glass cover on the aquarium itself?

Shirley Smith
via email

A Since the light fixture is already outfitted with a protective lens, I would lean toward foregoing a glass cover and just leaving

the top of the tank open. Glass covers present several potential drawbacks in reef systems. They tend to trap heat and minimize evaporative cooling, impede gas exchange, and reduce the intensity of the light reaching your corals (particularly if salt and calcium deposits are allowed to build up on the glass). I would make an exception, however, if you have fish in the tank that are highly prone to jumping. In that case, a close-fitting cover is a must and you'll have to make accommodations to minimize these drawbacks—for example by frequently cleaning the glass cover to allow maximum light penetration and utilizing an open sump and high-quality protein skimmer to promote good oxygenation and gas exchange.



John A. Anderson/Shutterstock

■ Potentially reaching 17 inches in size, the graysby needs an appropriately large tank.

Q How Big Will a Graysby Grow?

Can you tell me how large the graysby really gets? I'd like to put one in my 125-gallon FOWLR (fish-only-with-live-rock) tank, but I'm finding all kinds of conflicting information with respect to its maximum size. According to FishBase, it grows to almost 17 inches, but other sources say 14 inches or even smaller. Who's right?

Maurice Brown
Royal Oak, Michigan

A The nearly 17-inch maximum size cited by FishBase is accurate for the graysby (*Cephalopholis cruentata*). However, as TFH

columnist James Fatherree frequently points out in "The Salt Mix," that figure represents the largest known specimen of the species, the record holder if you will. Most specimens are going to fall short of that maximum. That's why you're seeing so many different opinions on the subject.

Generally speaking, though, I think it's a good idea to assume a specimen will reach, or come pretty close to, the potential maximum size of

its species when planning aquarium capacity, other livestock selections, filtration demands, etc. That way, you're certain to have a decent margin of error no matter how big the fish gets.

In my opinion, it should be safe to add a graysby to your system, assuming the tank isn't already stocked to capacity and you avoid any tankmates small enough to be swallowed. *C. cruentata* is not an especially active fish,



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spending much of its time resting on the substrate, so as long as you provide adequate filtration and stay on top of those water changes, 125 gallons should be adequate housing for this species.



Fade to Black

My local fish store, which usually does a pretty good job

of accurately labeling fish, is selling a specimen labeled as a black damselfish. It's a beautiful fish, but there's no way it's correctly identified—though the young staffer there insists it is. The only black on the fish is on the front edges of the pelvic and ventral fins. These fins are sky blue otherwise. Apart from that, the fish is white overall with bright yellow extending

diagonally from the snout up into the dorsal fin. Can you determine what species it actually is from my description? I tried to get a picture of it with my cell phone, but it wouldn't hold still long enough. It's about 1½ inches in length if that's any help.

Dean Matchick
via email



Stephan Kerkhofs/Shutterstock

■ The black damselfish (*Neoglyphidodon melas*) is colorful when young but becomes entirely black over time.

A I'd say the young staffer at your local fish store is correct. Based on your description, the specimen you saw sounds a lot like a juvenile black damselfish (*Neoglyphidodon melas*). This is an example of a species that has to grow into its common name, so to speak. As it matures, that pretty, brightly colored little damsel will turn a uniform black. Plus, it'll get a lot bigger—over 6 inches—and a lot more aggressive to boot. There are several species in the *Neoglyphidodon* genus that find their way into the aquarium market, and they all have this same disappointing tendency to transform from cute, colorful juveniles into big, ugly bruisers.



No Anemone? No Problem!

I plan to set up a saltwater desktop nano tank specifically for a pair of common clownfish. I know most of the anemones that host clownfish won't work in my setup and have a poor survival rate in aquariums. I also understand that clownfish will sometimes adopt corals and other invertebrates as a host when there's no anemone in the aquarium. What's the best alternate host for a 15-gallon nano?

Demeter Gottlieb
Lowell, Massachusetts

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A First, let me point out there's no need to provide an invertebrate host, anemone or otherwise, for clownfish kept in aquaria. It's true they wouldn't survive long in the wild without one, but in the confines of an aquarium, where the hobbyist determines what livestock are included, the clownfish will not be subject to predation and should live a long, happy life if given proper care.

It's also true clownfish kept in aquaria will often adopt a surrogate invertebrate host when no anemone is present. These potential surrogates include a wide variety of soft corals, large-polyp stony corals, corallimorpharians, and others. In fact, the percula clownfish (*Amphiprion percula*) in my reef tank once adopted a *Tridacna maxima* clam as a host.

However, whether or not a clownfish will adopt a given invertebrate is entirely a hit-or-miss proposition. You might put something



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■ In the wild, clownfish must have a host anemone to survive, but in the aquarium they can easily live without one.

in there that would seem to be a perfectly good alternative only to have the clownfish ignore it completely. So, I really can't recommend the "best" alternate host for your system and specimens. Also, keep in mind that invertebrates don't always appreciate being adopted by clownfish and sometimes their health can even suffer as a result of the constant irritation.

Q Niger Trigger Long in the Tooth

I bought a Niger triggerfish, and I was just told its teeth will keep growing if they aren't somehow worn down regularly. Does that mean I'll eventually need to trim its teeth like I've heard many hobbyists do with puffers?

Pamela Mantel
via email

A As your Niger triggerfish (*Odonus niger*) ages, its teeth will tend to keep growing and, if not worn down, can grow to the point that they interfere with eating. However, keeping them from getting too "long in the tooth" is a simple matter of including shelled invertebrates, such as whole shrimp and

clams, in their diet (once the specimen is large enough to manage these foods, of course). Crunching through those hard shells and exoskeletons will wear down those beautiful red teeth nicely! By the way, the same concept applies to puffers. Given the proper diet of hard-shelled invertebrates, puffers really shouldn't require any amateur dentistry. 🐡



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ask jack

Dear Jack,

I recently saw an interesting article in the *New York Times* about the wildlife in Suriname, South America. I know you had been in Suriname, and I wonder if you could give me a tip or two about the country that I would not find in a travel guide. I will make a reservation in a hotel in Paramaribo, and will attempt to venture into at least part of the interior.

Jon Smitt
Akron, Ohio

Dear Jon,

I haven't been to Suriname for eight years, and made two trips there total—one to take some of my discus to a friend, and one to attempt to obtain some *Dendrobates* frogs. I received a lot of flack regarding the discus when a number of people accused me of placing them in Suriname waters. The fish had been placed in a private pond not accessible to any local streams.

The *Times* article probably wrote about the several hotels in Paramaribo that, when I was there, were not at all special. I had no interest in spending time in Paramaribo, and because my Dutch friend had his own two-seat private plane, I was able to fly with him to the "Sipilewind"—the Suriname/Brazil border. In that part of Brazil no discus can be found, but most of the animal wildlife can be.

However, with the exception of perhaps the ever-present howler monkeys, blue and gold macaws, plus many frogs and snakes, you will find more native animal wildlife (for sale) in the large Paramaribo marketplace.

Dear Jack,

When I aerate the water used in my discus aquariums, the pH jumps from about 6.5 or 7.0 to almost 8.0 when I check it. I think it might be better for me to obtain an RO unit and use that water in my discus aquariums. Do you think RO water is the answer for me?

Tio
Toa Alto, Puerto Rico

Dear Tio,

The probable reason for your water problem is that you are introducing oxygen into the water when you aerate it, and the oxygen then bonds with the inorganic salts (iron, magnesium, etc.), which are not soluble in your present water. If you don't aerate the water, the pH will still rise to approximately 8.0. However, it will take longer to reach that pH reading of 8.0 because it will take a longer time for the mineral salts to be released into the water.

Nevertheless, I would not suggest dashing out to purchase a reverse-osmosis water softener at this point. Why not first introduce a small number of tetras into your aquarium to see how they react? Any of the *Hyphessobrycon* species, which are generally not too expensive, would be fine.

If they do react in a perfectly normal manner, swimming and eating, for a period of 10 to 14 days, I certainly would not concern myself with the aquarium pH. In checking the pH later in the day, you will probably find that it has dropped below the 8.0 reading.

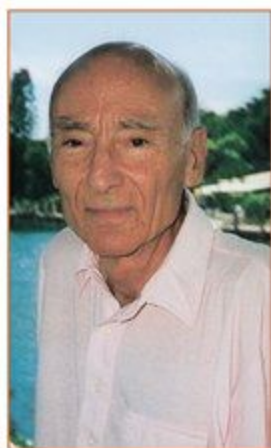
I'll attempt to answer another question you had about "cloudy" aquarium water at times for no real reason. I believe what you have seen is probably a different type of chlorine being introduced into your municipal water supply. This scenario here in South Florida occurs at least once per year, when the local water departments change the method of chlorinating the water supply. This action is always scheduled to ensure the bacteriological integrity of the water-distribution system.

Water departments generally employ chloramines (chlorine and ammonia) most of the year, but for a period of several weeks, they switch to free chlorine, which has stronger disinfecting properties than chlorine and ammonia.

At least here in our county, the municipal water department notifies everyone—by newspaper, TV, and in their water bills—exactly when this cleaning is to take place.

In addition to causing aquarium water to turn cloudy, free chlorine also has, in many

Jack Wattley is worldwide the most recognized name in discus breeding. Breeder, judge, collector, scholar, Jack is the foundation on which modern discus keeping has been built. He has been sharing his experience and knowledge—and the discus he breeds—with aquarists throughout the world for decades, and just one of his many awards was his recent Lifetime Achievement award from the ACA. Long past the age at which most people retire, he still serves as ambassador of discus and goodwill across the planet.



jack wattley

cases, a slightly different taste and odor. I suggest you call your local water department and ask if they ever change your water makeup from chloramines to free chlorine. I believe you will find them happy to be of any help.

When I had my discus hatchery here in Fort Lauderdale, I made an appointment with our local water department to be able to view the process used in making our water suitable for drinking, etc. I was able to view everything, asking many questions, in the 40 to 45 minutes I was there. I took along with me all my water-testing kits, which the chemist thought to be very suitable.

Dear Jack,

A tropical fish breeder here in Santa Fe recently told me that some breeders sterilize their young fish for sale in order to ensure that the young fish will not be able to eventually breed. Please tell me what you think.

Dawn Watson

Santa Fe, New Mexico

Dear Dawn,

To my knowledge, no, it's not true that tropical fish breeders sterilize fish for any reason. I have been asked this question a few times—once when I sold three adult discus to a “gentleman” who accused me of it when the fish didn't breed. Most breeders probably wouldn't know how to sterilize a fish, and if they did know, they wouldn't deem it necessary. Nor would any of us have the time to do so. I know that I don't have the time, nor the desire, to sterilize any fish.

When black angelfish first made their appearance here in the United States, some hobbyists had trouble breeding them and put the blame on the Hong Kong commercial tropical fish breeders who developed the angelfish, accusing them of sterilizing the fish for export, which wasn't the case.

You also asked me whether airport X-ray scanners can cause damage to fish. In my experience, these machines cause no damage of any kind—because the X-ray happens to be very weak. When I gave discus presentations to aquarium societies, I always brought along young fish (before 9/11) for the club, and these fish all passed through the scanners with no problems.

Dear Jack,

I know you are feeding your discus top-quality flake foods, and no more live or frozen fish foods. I still like the idea of



Dmitrijs Mihejevs/Shutterstock

■ If the water chemistry is suitable for *Hyphessobrycon* sp. tetras, it will likely be suitable for discus.

preparing fresh or frozen discus foods and would appreciate your telling me what foods I might be missing for my discus.

Vincent McManus

Princeton, New Jersey

Dear Vincent,

The nice thing about writing to you about the foods I've fed my discus is that so many of them are foods I eat nearly all the time—foods from the sea, not from some processed food company.

I experimented with many foods and my own formulas, and these control tests, to be effective, were run for at least four weeks. One test consisted of live adult Artemia, fresh organic beef heart, algae from the Bahamas,

micro-algae (Chlorella), and Florida lobster I caught myself. I saw the best growth from the fish fed organic beef heart.

The Japanese algae make very interesting additions to any discus foods and are nicely accepted by discus. Because I cut them myself, they were always included in the various formulas. If you enjoy sushi, these algae are nearly always available. You'll find them in Princeton—at the university, the student body lives on sushi and sashimi.

I found fresh, raw tuna to be an excellent addition to any discus-feeding program, with wild-caught discus especially. Many times these fish refused the usual offerings, but nearly always began to feed when offered raw tuna. 🐟



cichlid world

Cichlids of Lake Malawi

I was pretty much a generalist in terms of fishkeeping before I went off to college. Sometime in eighth grade, I got my first real fish tank—you know, the kind with the silver metal frame and the black tar holding the glass in place. I remember trying my hand at breeding angelfish and cherry barbs and having some luck with bettas. Black mollies were a challenge because the females kept dying before giving birth. I suspect now that moving them to the small, floating breeding trap had something to do with it. The fish I probably remember the best was the albino *Corydoras*, whose eggs I managed to raise with minor success. It was around this time that my fascination with whiteworms developed.

If I had any other cichlids besides the angelfish, they were probably convicts because my friend Glenn had a whole bunch in his 55-gallon tank, a monster of a tank for me in those days. Rams were popular at the local fish store, but wildly expensive at \$6.00 a piece I recall. I remember being stunned one day when six were purchased by this guy, all at one time. That was a lot of money. A large can of the popular German flake food sold for \$5.00, a small fortune for me.

College interrupted my hobby activities, though the second year in the dorm, I managed a 10-gallon community tank in the corner. But back on the home front, my younger brother Mark had caught the bug. He converted the big tank, a 20-long, into a very nice paludarium, which was something I had not thought of, being so focused on fish. But there in a tank below, he had found a most amazing creature, a bright, solid-blue animal the likes of which I had never seen. “What is that, a cichlid?” I asked. And so, in 1973, I was introduced to the cichlids of Lake Malawi.

Starting with Malawi Cichlids

He had purchased the cobalt cichlid at a local department store in the Chicago suburb of Elmhurst, known as E. J. Korvette’s—the pet department was pretty good. There were some other African cichlids swimming around. Some of these first African cichlids, identified in the 1973 edition of Axelrod’s *African Cichlids of Lakes Malawi and Tanganyika*, included *Haplochromis venustus*. There were four color morphs of *Pseudotropheus zebra*, *P. auratus*, and *Aulonocara nyassae*, which was listed but not pictured.

Time went by, and eventually I bought out a small cichlid breeder and acquired four tanks and the fish, including *Aulonocara nyassae*, which was known as the red shoulder peacock, and *Pseudotropheus dinghani*, now known as *P. flavus*. The *P. dinghani* I remember was very purple, not yellow like *P. flavus*, and I suspect it was some other creature entirely.

The pet stores soon filled up with other Lake Malawi cichlids, including *P. exasperatus*, or *Labidochromis textilis*, which has now been renamed *L. joanjohnsonae*.

Now before you go all crazy with the names, let me assure you that almost all of these have changed in the last 40 years. The genus *Haplochromis* was split up, with *venustus* going to *Nimbochromis*. Those four color morphs of *zebra* have exploded into dozens of different species.

The lake was called Lake Nyasa by David Livingston, but that basically means “Lake Lake.” When Nyasaland became Malawi in 1964, the name of the lake changed too, though not all African countries have recognized the change. The same is true of the names of the fish. While *Maylandia* was

Eric Hanneman brought goldfish home in those white, waxy cardboard boxes with the metal handle as a child and started his first aquarium in middle school in the Chicago area. He got into the African cichlid frenzy and started breeding Tanganyikans before moving to the West Coast for graduate studies in neurobiology. He has traveled to Mexico, Central America, and Africa to see cichlids in the wild. For five years he owned and operated a tropical fish specialty store. He now works as the aquarist at the North Carolina Museum of Natural Sciences and is most interested in the cichlids of Guatemala.



eric hanneman

proposed as a subgenus of *Pseudotropheus* in 1984, it was thrown out in 1997 and replaced with *Metriaclima*. Some authors attempted to resuscitate it two years later, and it is still recognized as valid on FishBase, but this is one where I would agree with Ad Konings and stick with *Metriaclima*.

Not only have some of these species' names changed, but some have also become hard to get, since the area where they were originally collected is now Lake Malawi National Park, located at the southern end of the lake, on and around the Nankhumba Peninsula. The American Cichlid Association has financially supported the placement of anti-netting devices in this area, which have succeeded in increasing the numbers of fish, especially the sand-dwelling Utakas in the genus *Copadichromis*.

Eventually, around 1980, I saw an ad in the paper for a cichlid auction, hosted by the Greater Chicago Cichlid Association. When I got to the hotel, I could not believe how many people there were, all into cichlids. I was spending money, and suddenly, I won the raffle with a \$50 cash prize. Not only did I spend it all, people stopped bidding against me, knowing I could outbid them anyway. My first fish box got very full.

I made some mistakes and learned a lot about African cichlids through the GCCA and the American Cichlid Association. My first homemade aquarium held about 150 gallons and was filled with every color variety of *Pseudotropheus* I could find. I wondered how many different colors would be produced by breeding all of those different color morphs of *P. zebra* together. Little did I know how many species were in that tank. The true diversity of species in Lake Malawi was yet to be revealed.

Perhaps one of the easiest to recognize genera found in Lake Malawi is *Melanochromis*. *M. auratus* was one of the first species to be imported in the 1970s. But it was not until 1975 that it was given that name by Don Johnson. It started out as *Chromis aurata*, named by George Boulenger in 1897. In 1898 he renamed it *Tilapia aurata*, where it stayed until 1922, when Charles Regan renamed it *Pseudotropheus auratus*.

The Genus *Melanochromis*

Today the genus *Melanochromis* represents one of the best-known groups of fishes in the lake. This is due in large part to some simple and clear diagnostic patterns that differentiate this group from



Eric Hanneman

■ *Pseudotropheus* cichlids are a staple of Lake Malawi.



Mark Denaro

■ *Metriaclima callainos*; *Metriaclima* cichlids were originally named *Maylandia*, and some sources have clung to this initial designation.

the closely related *Pseudotropheus*. First, *Melanochromis* have two black horizontal stripes, the lower one along the lateral line, and the upper one between it and the dorsal fin. The second diagnostic involves the reversal of color pattern in breeding males. In most species, the color pattern reverses. The entire body becomes, blue, brown, or black, and the two previously black stripes lighten, becoming white, yellow, or blue. Of cichlids from Lake Malawi, only those in the genus *Melanochromis* undergo this color change. Previous distinctions based on the size and position of pharyngeal teeth are not considered to be significantly different anymore between *Melanochromis* and *Pseudotropheus*.

The species in *Melanochromis* that follow these color-pattern rules include *melanopterus*, *vermivorus*, *auratus*, *simulans*, *chipokae*, *loriae*, *robustus*, *heterochromis*, *dialeptos*, *baliodigma*, and *mossambiquensis*. There are four species in *Melanochromis*, *lepidiadaptus*, *wochepa*, *kaskazini*, and *mpoto*, where the color reversal is incomplete. The background

color becomes darker, in all cases sky blue, and the black stripes disappear, but the bars are not converted into a lighter, contrasting color.

Several species have been removed from *Melanochromis*, but two merit special mention. *M. joanjohnsonae* is now *Labidochromis joanjohnsonae*, and *M. labrosus* is now *Haplochromis labrosus*. These distinctions are important, not because of where these two species are placed, but because by removing them from *Melanochromis*, the genus is now rendered monophyletic. This means that all of the species are from the same evolutionary group, and closely related. Moreover, there are currently no undescribed forms known in the lake. It is now possible to collect every species of *Melanochromis* from Lake Malawi.

Collecting Malawi Cichlids

Anyone attempting such a feat should start out with 15 large tanks. Along with many other species from Lake Malawi, the *Melanochromis* species can hybridize. Only

a few of them are found in overlapping territories, one of those pairs being *M. mpoto* and *M. kaskazini*. Otherwise, the genus *Melanochromis* is one of the nastiest for its size anywhere. Individuals are highly territorial and all the rules of keeping mbuna, the rock-dwelling cichlids in the lake, are especially applicable to them.

These include having many fish in the tank. Mbuna need to be crowded so that large territories cannot be established, lest all but one of your fish spend most of their time cowering in an upper corner of the

tank. For some species it is preferable to have a single-species aquarium. In this case, it is wise to have many more females than males. What is interesting is that subdominant males will simply maintain the female/juvenile color pattern in an attempt to hide from the dominant male, and perhaps sneak in during a spawning ritual.

I find it more pleasant to have several species in a tank if possible, and one way to do this is to have species from fairly diverse groups. Besides your favorite

Melanochromis, try a *Labidochromis coeruleus*, a *Labeotropheus trewavasae*, a peacock like *Aulonocara baenschii*, and a *Nimbochromis venustus*. By supplying plenty of territories using rockwork and a large tank, males of these species can successfully establish territories and breed in the same aquarium. Again, keeping five to six individuals of each species is best, with the number of females outnumbering the males.

Sometimes I find that I am most interested in breeding a certain species. In this case, it is helpful to set up the community tank so the target species is the dominant species in the tank. That way, it will more likely get to breed. Females of subdominant species whose males cannot establish breeding territories may be tempted to breed with another species' male, so be careful when growing fry out, and keep a large predator somewhere in the fishroom.



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Mark Denaro

■ *M. greshakei*; a number of *Metriaclima* are more difficult to attain nowadays because of protective measures that have been placed on their collection points in Lake Malawi.

Some Malawi cichlid keepers like to keep tanks with only males, assuming there will be less aggression and all the fish will be colored up. You can sell your extra males to them. I think this all-male tank is fine, but such hobbyists miss out on the fascinating behaviors cichlids exhibit when guarding territories and spawning. If you do not want to produce fry for sale or trade, simply let the females release their fry into the tank, where some will survive. The number and sizes of the rocks can definitely have an impact on this. I have had *Metriaclima zebra* colonies where a dozen adults produced over 150 fry in the course of a year. A tank full of *A. baenschii* failed to give me the same result. Don't be afraid to try something different. The number of species in *Melanochromis* may be well known, but how they behave and interact with other species is an area where much remains to be discovered.

Jack Wattley

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the planted tank

Algae in the Planted Tank

Among the racks of tanks in my basement is a curious little 20-gallon long setup. There's nothing particularly special about it, aside from it being the one tank where I allow algae free rein to grow.

Algae has long been the bane of the aquarium hobby, obscuring glass, discoloring water, and coating décor with clumps and strands of unsightly growth. Its appearance in a tank is often met with frantic attempts to quash it by any means possible: two-day-long tank blackouts, algaecidal chemicals (also often deadly to snails), hasty purchases of algae-eating fish, and so on. Clearly, it is a thing to be dreaded and avoided in your planted tank—except for the fact that algae isn't really all that bad.

Yes, you read that correctly. The unsightly harbinger of doom and gloom isn't actually the end of the world; certain types can be used to create desirable effects in an aquascape.

Algae in Nature

Find me an environment in which algae cannot grow, and I'll show you an environment not fit for any living thing. Algal growth is a vital component of the biodiversity of the planet. Every body of habitable water, every surface, even every breath you take contains algae. Pick up any rock sitting in any river or pond anywhere in the world, and (unless an algae-munching organism has recently visited) I virtually guarantee it will have algae on it. Algae is everywhere. The key

is to control which types to keep around and where to let them grow.

The Dreaded Moss Ball

Certainly no one likes algae on glass—it blocks the view of the aquarium and looks highly unattractive. And no one would recommend maintaining murky, green water. But at the same time, pet shops sell “moss balls” by the dozens, without customers ever realizing they are actually buying big globs of algae to plop in their tanks.

This isn't to say no one should ever buy a moss ball, as they are a perfectly amusing decoration for an aquarium. Algae are plants (albeit in the broadest sense), and most species confer more or less the same benefits as plants in the microcosm of the aquarium—consumption of waste products, removal of excess nutrients from the water column, etc. The buyer of the moss ball just needs to be prepared for the possibility of *Cladophora aegagrophila* (the algae species “moss balls” typically consist of) popping up in other places in the tank. If algae bushes growing on other pieces of décor, filter intakes, or the glass distress you, a moss ball might not be something on your planted tank shopping list.

Others, however (myself included), find the tufts of bright green a welcome accent on pieces of driftwood or rocks. Combined with a healthy biofilm, attached mosses, and rhizomatous plants, hardscape items with algae serve

Amanda Wenger is a lifelong hobbyist who inherited a love of aquaria from her father, when he gifted her with her first fish at age two. A decade and a half later, she started putting plants in the fish tanks and was hooked. Today, she lives in Connecticut, where she's the current President of the CT Aquatic Plant Enthusiasts (CAPE) and, with the assistance of her family, maintains a well-planted fishroom and a hobby-sized greenhouse filled with aquatic plants. She's also part of the moderating staff at AquaticPlantCentral.com. Aside from the aquarium hobby, Amanda is a professional illustrator and graphic designer with a soft spot for wildlife illustration.



amanda wenger
photographs by the author

more or less as a freshwater equivalent to marine live rock, with its coating of myriad beneficial bacteria, algae, and invertebrates. Algae colonies in moderation serve to naturalize the tank and make the hardscape look aged, as if they're part of the environment and not just something the aquarist plopped in the tank the day before. In an aquascape where the goal is to make the tank look as natural as possible, this is an extremely beneficial effect.

Other potentially useful algae types are the "green spot" (which form light coatings of bright green dots and blobs on surfaces) and brown algae (actually diatoms), both of which are excellent for contributing to the live rock appearance of a hardscape. Diatoms are also an excellent food source for invertebrates (of both ornamental and fish-food varieties) and are often picked at by fry.

Managing Your Algae

Certain species of algae are undoubtedly more attractive and useful than others. Still, others are only useful in certain locations. Eradicating one kind of algae while leaving another in place can be something of a challenge. Fortunately, the more different the algae forms, the more disparate their needs, and that disparity can be exploited to favor the growth of certain forms.

One of the reasons *Cladophora* spp. are successful in the planted tank (to the benefit or chagrin of hobbyists) is that they tend to behave more like true plants than other algae—they're resistant to algaecidal chemicals, generally unpalatable to algae-eating organisms, and (comparatively) slow growing. These qualities make them difficult to outright eradicate, but simple enough to manage. Unwanted growth can be scraped off glass with a razor, or scrubbed off items with a toothbrush. Any plant leaves overtaken by clado can be trimmed and removed fairly easily, as its growth is slow enough to not devour whole leaves seemingly overnight.

Algae with Negative Effects

I should note at this point that I'm not trying to give all algae a free pass to try and overtake your tank. There are many kinds of algae that have little to no positive effect on your aquascape,



■ Despite its reputation as an eyesore, algae has some redeeming qualities that include brightening up hardscape elements.



■ Moss balls, a pet shop staple, are essentially globs of algae.

and these should be eradicated with impunity.

GREEN WATER

First and foremost among these undesirables is so-called green water. Green water, which commonly occurs after the initial setup of a tank or a

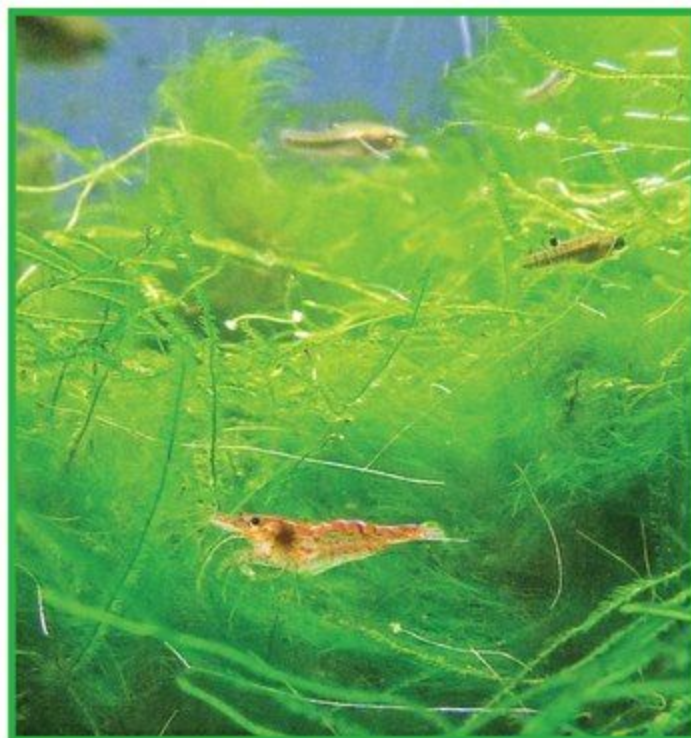
change to the water parameters, is the result of rapid multiplication of unicellular photosynthetic organisms in the water column (which includes both green algae species and their protist consumers, such as euglenoids).

Two things must happen to cause green algae to bloom. First, there must be

abundant lighting to support a high rate of photosynthesis, and second, there must be an excess of nutrients (particularly, but not exclusively, phosphates) in the water that allows for the explosion in growth. As such, the approach to curing green water is twofold: removing nutrients from the water (through regular water changes and/or reducing the dosage of fertilizers) and reducing available lighting through a temporary blackout (covering the aquarium to obscure ambient light and turning off all lighting equipment). A brief (24- to 48-hour) blackout will not adversely impact the lifecycle of your plants (or more complex algae like *Cladophora*) but will quickly interrupt the growth of green-water organisms. Aside from the obvious aesthetic harm, green water consumes oxygen at night and can induce lethal hypoxia in more desirable organisms (fish, invertebrates, etc.). As such, use additional aeration in your tank while treating it.

CYANOBACTERIA

Another harmful “algae” is the blue-green variety. These are technically colonies of cyanobacteria (often bluish



■ The persistent nature of *Cladophora* would normally make it troublesome if it weren't for the algae's slow growth rate, which makes it practical to keep under control.

green in coloration, but also occurring in reds, purples, oranges, etc.) and are not truly algae, but because they appear superficially similar, I believe they deserve mention. Apart from their tendency to coat the entire tank in an ugly thick slime, some cyanobacteria are known to produce very potent

hepatotoxins (liver poisons). Before you start fleeing the scum in terror, though, note that the vast majority of aquarium infestations are harmless to humans, and you need only be concerned if the bloom is associated with mass mortality of your aquarium's livestock. Although I generally recommend avoiding chemical/medicinal treatment of algal issues, cyanobacteria is one variety that may require the use of antibiotics to fully eradicate. Just be aware that antibiotics can also disrupt your biological filter, and therefore your water parameters must be monitored extremely carefully.

Algae: Good or Evil?

In any case, you're free to make your own judgments about utilizing algae as a part of your aquascape or eradicating it from your setup. As for my little 20-gallon tank, it continues to draw the attention of visitors despite its lack of formal design, and its colonies of shrimp, snails, and least killifish (*Heterandria formosa*) continue to thrive. 🐾



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life with livebearers

The Cortes Swordtail (*Xiphophorus cortezi*)

This month I'm writing about a very nice swordtail, the Cortes swordtail or delicate swordtail (*Xiphophorus cortezi*). While this fish has been distributed among more serious hobbyists, it is virtually unknown to the hobby at large. I got this species from Rusty Wessel, a tireless collector of south-of-the-border fish, mostly cichlids, but also some nice livebearers. One day in 2011, Rusty emailed me, "I can send the *X. cortezi* if you want them? I prefer to ship in the next few days for I will soon be off collecting for most of April and May. Cheers." The collecting he spoke of was yet another trip to Mexico and Central America. Lucky stiff!

In a few days, 20 *X. cortezi* arrived via priority mail. Rusty had collected them from the Rio Coy, Tambaque, San Luis Potosí, Mexico. They arrived in good health and were placed into a quarantine vat, although Rusty's fish are always healthy and disease-free.

The Genus *Xiphophorus*

The Cortes swordtail (named after the Cortes region in Mexico) is a member of the widespread genus *Xiphophorus*, which is aptly Greek for "sword-bearer." Not all members of the genus have sword-bearing males. Many of the platies, which belong to the genus, don't. *Xiphophorus*, according to the Integrated Taxonomic Information System, contains 26 valid species and has a natural range from northern Mexico south to Honduras. Three of its species, *X. hellerii*, *X. maculatus*, and *X. variatus*, have become established in other locations, including warm-water springs in the United States. In Texas, *X. hellerii* is established in the headwater springs of the San Antonio River.

Most authorities divide *Xiphophorus* into four groups of closely related fish, northern

and southern swordtails and northern and southern platies. *X. cortezi* is generally assigned to the northern swordtails.

X. cortezi, according to Serva and Trash ("The Treasure of Cortez—*Xiphophorus cortezi*"), is naturally found in the Rio Choy, Arroyo la Calera, Arroyo San Jose, and some independent tributaries of Rio Tampoan, as well as in tributaries of Rio Coy and Rio Moctezuma throughout Sierra Potosina. The Rio Coy is interesting because they say it is found in tributaries of the Rio Coy from Sierra Madre, but not in Rio Coy itself. However, even though they specifically excluded the Rio Coy but did include its tributaries, the Rio Coy is precisely where Rusty Wessel collected the fish sent to me. So, apparently early collectors missed this fish in the river. Additionally, it can be found in all tributaries to the Rio Axtla system, including the headwaters of the Rio Tancuilin at Rio Verdito and the rock pools of the arroyos Xilitilla and La Conchita, Xilitla, and Rio San Pedro and Rio Candelaria.

Description

The Cortes swordtail has a body shape intermediate between *X. variatus* and *X. hellerii* and sports a short, upturned yellow sword lined on top and bottom with black. Males especially, and females to a certain extent, have black freckling in the dorsal fin and the top of the body. Males show a pale yellow in the fins. Males often have four to five vertical black bars beginning mid-body and progressing toward the tail. The males' dorsals are wide and reminiscent of those of *X. variatus*. Males have 2-inch bodies and females are a bit larger, but not appreciably so.

Habitat and Behavior

The Cortes swordtail is fairly typical of its genus. It lives in moderate-flow streams,

Charles Clapsaddle began keeping fish at age 7, winning some goldfish at a carnival. Successfully spawning them, he was hooked on fish. Mastering goldfish, his attention turned to livebearers, locally collected mosquito fish (*Gambusia affinis*), and sailfin mollies (*Poecilia latipinna*). By junior high he graduated to fancy guppies. His fascination with livebearers continues. Although his commercial hatchery breeds many other fishes, the development of new livebearer strains and the improvement of existing strains occupy his best efforts. Charles speaks to aquarium clubs across the country on various hobby topics. He has a BSc in Zoology from The University of Texas at Austin.



charlesclapsaddle

photographs by the author

staying in loose shoals near the bank or vegetation. In the aquarium, *X. cortezi* behaves much like its close relatives, the other swordtails and platies. Females tend to stay in small shoals rather than form schools like danios and barbs do. Males are nearby, where they often spar with each other with little or no damage. Dominant males chase subordinate males in an effort to monopolize matings and spend a significant amount of time courting the largely unresponsive females. Subordinate males hang nearby awaiting any mating opportunity.

Fry occupy safe locations up close to the bank in shallow water or in weed beds. In our vats, fry are found clustered at the top in floating hornwort or in the safety of our breeding cages. Juveniles, once achieving a size too large to fit in the adults' mouths, hang out with the adult females. Sparring for dominance begins early with youngsters displaying tail to nose in circling pairs.

Rearing the Cortes Swordtail

We raise the Cortes swordtail exactly as we breed domestic swordtails and platies. We place 40 to 60 selected females in a 55-gallon vat with about six males. In each vat, we place a breeding cage and some hornwort to provide shelter for the ensuing fry. Every six to eight weeks, the breeders are moved to a new vat. New breeders are added as necessary to replace losses due to accident or old age.

The fry are allowed to remain in their vat for another six to eight weeks, at which time most are large enough to be moved to a sales vat. Breeders are selected for their adherence to wild-type conformation and coloration and their general vigor. As with all fish maintained under artificial conditions for several generations, there is rapid domestication. Fish that are timid or easily frightened, good survival skills in the wild, leave fewer offspring than those that are brave and bold (translate "brave and bold" to "foolhardy" for fish living in the wild). These characteristics are heritable, and those good for survival and reproductive success in the aquarium predominate after a few generations while those good for survival in the wild disappear. Our fish are thoroughly domesticated.

For the hobbyist wishing to raise the Cortes swordtail, if you can raise and propagate domestic swordtails, platies, and variatus platies, you should have no difficulty doing the same with this species.



■ The dull yellow coloration on *Xiphophorus cortezi* males would probably be more effective in attracting mates if it were brighter, but that would also increase their odds of attracting predators.



■ Female Cortes swordtail (*X. cortezi*).

Maintaining Pure Strains Versus Creating Fancy Varieties

While we are maintaining pure stocks of *Xiphophorus cortezi*, I have some other plans for this fish. It has a broad dorsal fin that I imagine could be used to improve hifin swordtail dorsals. Hifin swordtails tend to have narrow dorsals, which can be improved by crossing to variatus platies. But the resulting males, while having very large bodies for reasons I'll discuss in a future column, have anemic swords. Since variatus platies have dorsals very similar to the Cortes swordtail, I'm hopeful that domestic hifin swordtails crossed with Cortes swordtails will produce offspring with improved hifins and better swords than swordtail/variatus platy hybrids.

As with all hybrids we produce, these fish will be rigorously segregated from the pure *X. cortezi* to prevent genetic contamination of the pure strain. It is especially important to never reintegrate a Poeciliidae female mated to any fish other than her own species to a breeding colony. (Poeciliidae species include most livebearers commonly found in the hobby, such as guppies, mollies,

swordtails, and platies.) Poeciliidae females, due to the sperm-retention and -storage characteristics of these species, must be considered genetically contaminated once exposed to males of any other closely related Poeciliidae species. This certainly includes swordtails, platies, variatus, and all other species of *Xiphophorus*, which, from what I have been able to determine, are all capable of mating and producing not only viable but fertile offspring. To prevent genetic contamination of the breeding colony when maintaining pure species of *Xiphophorus*, it is important to never house two or more species of this genus together.

The same prohibition should apply to the species of *Poecilia*, the guppies and mollies. While I've never been able to produce guppy/molly hybrids, I've seen reputable reports of such hybrids, so while I consider such hybridization unlikely, I'd still not keep guppies with any other *Poecilia* species.

Another issue related to maintaining pure species is selection by the owner of fish not typical of the species. This is, to use a British term, a "sticky wicket." While not entirely sure of the etymology of this term, I think it describes a "difficult circumstance." The difficult circumstance here is that it is perfectly natural for the hobbyist to select the most attractive fish as breeders. However, in nature there is often contravening selection against attractive males. While the females, given choice, probably prefer the more attractive males, such males are subject to increased predation. Being colorful and flashy is much like wearing an "eat me" sign. So, females prefer bright, colorful males (this is supported by lots of research), but bright,



■ Cortes swordtails often congregate in shoals.

colorful males are less likely to survive. The males are subjected to two contradictory selection pressures.

The muted yellow coloration of the male Cortes swordtail is probably a compromise; any drabber and females won't like him, but any brighter and he is dinner.

Improving a Strain

There are no predators in the aquarium. The hobbyist controls breeding through culling. It's difficult to avoid selecting

attractive males, males that wouldn't survive in nature. I try to err on the side of attractive but not so attractive as to be atypical of wild fish. Even so, I'm not immune to the desire to improve a fish. When I succumb to this urge, I separate the improved fish from the wild-type fish and maintain separate lines and breeding colonies.

An example of this is our marble *Poecilia velifera*, the Yucatan sailfin molly. Some black-freckled fish appeared in our *P. velifera* from Isla Mujeres, an island off

the coast of Yucatan. I liked the fish, so I selected the freckled fish and from them developed a marble *P. velifera*. These fish are kept separate from our wild-type *P. velifera* and aren't offered and sold as wild-type fish.

Appreciating the Cortes Swordtail

After that long digression, let's return to the Cortes swordtail. This fish is worthy of keeping as a wild-type fish, but it is also fodder for hybridization with the goal of producing superior hifins in swordtails. It might also have application in producing broader hifins in maculatus- and variatus-type platies as well. Additionally, I envision a yellower swordtail through selection of fish showing increasing yellow coloration. Now if I can just convince Susie, my wife, that I need another greenhouse, I might have space to do all of this.

Well, that does it for this month. Remember, you can send any questions or comments to me at goliadfish@goliadfarms.com. If I use your e-mail, you'll see your name in print.

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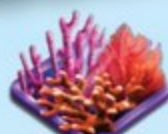


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import report

Tissue Culture Aquatic Plants

While the techniques for culturing live plants via tissue culture or micropropagation are not new (and a cursory Internet search for “tissue culture aquatic plants” will yield several how-to guides for advanced hobbyists), tissue-culture plants have not been commercially produced on a large scale until very recently. With the overwhelming popularity of nano aquariums and freshwater invertebrates (especially shrimp), tissue-culture plants should easily fill a niche in the hobby for both advanced aquarists and beginners.

But first, without getting too involved in the technical, scientific aspects of micropropagation, it bears explaining what exactly tissue culture means and how it works. Traditionally, aquatic plants grown for the hobby originate in greenhouses and reproduce more or less naturally—if you’ve ever seen a mother Amazon sword with numerous baby plants extending from a runner, you have a pretty good idea of how this works. With tissue culture, however, plants are produced by using a thoroughly sterilized portion of a parent plant and then cultivating that small (potentially as small as a single cell) section on a nutrient gel medium. The result is a fully formed plant that has been grown in a sterile environment—free from the omnipresent algal spores, snail eggs, duckweed, and other contaminants unavoidable with greenhouse-grown plants.

The benefits here are obvious. Anyone who has struggled with an infestation of snails, duckweed, or black brush algae in a planted tank can relate to how frustrating that can be. For retailers, being able to store these plants for up to several months in their individual, shelf-friendly



packaging is a huge advantage. The best part of these tissue-culture plants, in my opinion, is something many of us around the office discovered after planting some prototype and sample plants—unlike almost all aquarium plants that are grown emersed and experience some die-off when first planted, the tissue-culture plants seem to take immediately when placed in a tank. Tissue culture plants should be hitting local fish stores near you over the next few months, and I would expect to see many more varieties made available in the coming year.

Splendid Garden Eel

Previously a real rarity in the trade with almost no information available about its captive care or habits, the splendid or orange-barred garden eel has recently been making semi-regular appearances here at Segrest. Much has been written about the spotted or common garden eel (*Heteroconger hassi*) and its generally poor track record in captivity, but, as with many other aspects of marine husbandry, better understanding of this fish’s requirements has led to greater success with this species. Despite this, it is still a challenging species and not among the hardiest of aquarium fish to acclimate.

The splendid garden eel, however, appears to be a hardier fish that

readily acclimates to aquarium life when its requirements are met. Of great importance with this species is providing adequate cover while they are being held at an importer/wholesaler facility as well as in a retail setting. We provide ours with a layer of fine sand, which allows them to burrow and feel secure. Without the



Mike Tuccinardi began working at a local fish store on weekends at the age of 13, and even then it was obvious that working with fish in some capacity was all he wanted to do. He spent many years learning all he could about the amazing variety of fish brought in. This fascination led him to follow the supply chain upward and make the move from Massachusetts to Florida to begin working for Segrest Farms, the world’s largest tropical fish wholesaler. His first few months there were a continual learning experience, as he not only learned about how imports went from a local collector and into a facility but also how domestic production and the fish farm industry works.

mike tuccinardi

photographs by the author



ability to burrow, these fish will remain stressed and most likely refuse to eat. These eels can be hesitant to feed at first, but once they have settled into an aquarium, they should accept frozen mysis shrimp, brine shrimp, and cyclops. In the wild, these fish are communal burrowers who rarely leave the safety of their burrow even to feed, so aggressive feeders like angels, wrasses, or damsels will almost certainly outcompete the much-less-assertive garden eels for food. While this attractive and unique fish is by no means impossible to keep as was once thought, I would caution that any garden eel species is best left to experienced aquarists willing to dedicate a specialized tank for these fish.

Pencilfish (*Nannostomus* spp.)

In the last several months, we have seen an influx in the availability of both wild and tank-raised pencilfish, those tiny, peaceful characins so popular among nano- and planted-tank enthusiasts. Collectors of wild fish as well as fish farmers worldwide have taken note of this trend toward smaller aquaria, and many small fish that were once overlooked are now entering the trade more frequently. Many of the pencilfishes are ideal aquarium residents, and we continue to see new color variants and new species appear with some regularity.

PURPLE MARGINATUS PENCILFISH (*N. RUBROCAUDATUS*)

Originally traded under the name *Nannostomus marginatus* “purple,” the purple marginatus pencilfish was described scientifically in 2009 and is still a relative newcomer to the trade. Collected from the upper Amazon in Peru, males of this species display a brilliant reddish purple that extends throughout the entire body when in full breeding coloration.

RED BECKFORD’S PENCILFISH (*N. BECKFORDI* “RED”)

A line-bred form of the aquarium classic Beckford’s pencilfish,



the red Beckford’s pencilfish is an attractive and relatively hardy fish that can be distinguished by a brilliant red stripe edged in gold above the characteristic dark horizontal stripe extending from head to caudal peduncle.

Flat Head Pike Cichlid (*Crenicichla* sp. aff. *stocki*)

The flat head pike cichlid arrived just as I was completing this column, and it was so unique it caused me to scrap my previous entry entirely. Having been a fan of South American cichlids my whole life, and having been fortunate enough to see many a rare specimen pass through our facility here at Segrest, it’s not often I come across something that completely baffles me like this fish did. I was literally stopped in my tracks as I peered down into the tank housing these oddities. Naturally, the search was on for more info, but I soon realized that was easier said than done.



Poring over old Aqualogs and Aquarium Atlas reference guides got me nowhere, and even our exporter was at a loss for any concrete details on what exactly this strange cichlid could be. I learned it was collected in Venezuela, somewhere in the Rio Orinoco drainage, but beyond that, I was unable to get any specifics.

Further research led me to a series of articles and scientific papers describing what was once considered a separate genus of pike cichlids—

Batrachops (meaning toad-eye). This complex of big-eyed, big-headed pikes was merged with *Crenicichla* (the genus containing all pike cichlids and the most species-rich genus of neotropical cichlids) but contains some of the strangest looking and most specialized pike cichlids. Having narrowed the playing field a bit, I still found little solid information on this interesting and rarely encountered group of fish. Mostly rheophilic (preferring fast water) bottom-dwellers, the “*Batrachops*” complex contains specialized feeders that are primarily found in fast-moving rocky areas where they lurk amid the boulders and wait for their free-

swimming prey to approach from above. This group of pikes is characterized by their huge heads, relatively short bodies, large eyes, and protruding lower jaw—all evidence of their specialization as predatory bottom dwellers.

The so-called “flat head” pikes have the most pronounced features of the group, with truly massive heads (reminiscent of some *Channa* species), huge, widely spaced eyes, and a gill plate that extends past the dorsal fin. While not the most colorful of the pikes, they have a subtle, interesting pattern and impressive dorsal and anal fins. Females of this group will typically display red patches during the breeding season.

The flat head pikes we received appear very similar to *C. stocki*, a species described in Alex Ploeg’s massive *Revision of the South American Genus Crenicichla*. However, *C. stocki* is supposedly restricted to the Rio Tocantins,

Brazil, whereas the specimens we received originate in the Rio Orinoco, over 2,500 km (1,500 miles) northwest. So the question remains as to whether this represents a new species, a geographic variant, or something else entirely. Regardless, these fish are fascinating, unique, and undoubtedly a real rarity in the trade. Perhaps some intrepid South American cichlid enthusiast will take the time to make further notes on this species in captivity and identify it properly.

Australian Lungfish (*Neoceratodus forsteri*)



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Not a new fish by any means (this species is believed to have existed more or less unchanged for the last 100 million years!), the Australian lungfish is almost never seen in the trade, and for good reason. While the species is considered stable in its native Australia (several attempts have been made to list it as endangered or threatened, but each failed due to lack of scientific evidence for its decline), the Australian or Queensland lungfish is restricted under the Convention on International Trade in Endangered Species (CITES). This means that only captive-raised animals from licensed farms can be exported. In addition, to ensure that each fish can be traced back to its point of origin, every lungfish is microchipped using a passive internal transponder (PIT) that identifies its source.

We were fortunate enough to be able to import a shipment of these amazing living fossils recently (probably the first time in several years an Australian lung has entered the United States) as juvenile fish approximately 7 to 8 inches in length. Commonly attaining an adult size of over 40 inches, and with a life expectancy of over 80 years, this is certainly not a fish suitable for even the majority of advanced hobbyists. However, for those willing to dedicate the enormous amount of space necessary to house one, the Australian lungfish is reputed to be an excellent captive specimen, learning to recognize its keeper and even allowing people to pet it. One of the main reasons (aside from its titanic adult size) this fish is typically seen only in zoos and aquariums is the price tag—so before you start constructing that pond in your basement to house one, consider the several-thousand-dollar price these fish command in the US. 🐟



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adventures in aquascaping

An Elegant 5½-Gallon Nano: Part 2, Developing the Layout

In last month's issue, I talked about the importance of the mental game of aquascaping. This preplanning stage sets the tone for the rest of your layout. By paying attention to this step and firmly affixing the image of the aquascape you want *before* setting out to build the layout, you will achieve a much better execution of your vision.

This is your layout, your vision, and a reflection of your philosophy about the world your fish will one day inhabit. Take the time to fully visualize how you want it to appear and what kind of *feeling* you want to express. That single step will enable you to create something that goes beyond the technical components of the aquarium, and mastery of this step will allow the details to kind of fall into place.

Play the development of your layout over time through your head, over and over like a movie on loop. How does it look? How does it feel? How will the carpet spread and the hair grass wave in the flow of the water? How does it grow? It sounds a little metaphysical, but in the end, that will distinguish your aquascapes from all of the others that focus only on the technical points.

Expression Through Hardscape

For this 5½-gallon aquarium layout, I decided to pursue a classic *iwagumi* (Japanese rock arrangement) layout. The goal of *iwagumi* is to create an expression through the placement of stone and reinforce the impression that stone arrangement makes via plants. The foundation of this style stretches all the way back to what is popularly known as "zen rock gardens" (or *karesansui* in Japanese), and by looking at

this foundational inspiration, you can come to a greater understanding of what you are trying to achieve.

There are not many good words for describing the feelings you are intended to experience while looking at a zen rock garden. Words like "calming" and phrases like "a sense of peace" are commonplace but serve little purpose in explaining how you can achieve such. These feelings express an end point, a completed picture, and without knowing how to create and express those feelings, these descriptions do you little good.

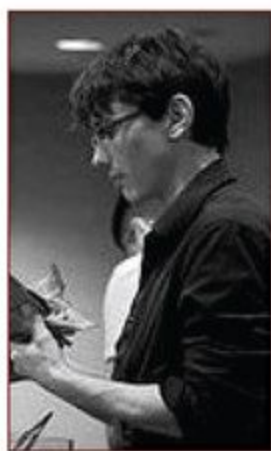
They are valuable in terms of establishing process, however. More than anything else, the aquascape, from preplanning to execution, and finally to completion, is about a sense of process. Being attached to each step, achieving through way of execution, and exercising a sense of joy will lead to a layout that inspires a sense of soothing calm for others.

Creating That Sense of Zen

The basis of *iwagumi*, having its foundation in zen rock gardens, concerns miniature landscapes. Many of these incorporate rock arrangements that suggest elements such as riverbeds, mountains, or a chain of islands. Sand represents water, and the lines in the sand signify the flow of water around objects.

This is not to be confused with a *literal* interpretation of a mountain or island, however, but the *impression* of such elements. The goal isn't to overtly recreate a mountain; it is to inspire a sense of one while leaving it open to interpretation. These interpretations are often on a very,

Frank Wazeter serves as the managing director of Aqua Design Amano USA, headquartered at Aquarium Design Group in Houston, Texas. A student of the art of aquascaping and teacher of the planted aquarium, you can follow him on facebook at <http://facebook.com/fwazeter> and Aquarium Design Group at <http://facebook.com/adgonline> for more information and insights into Nature Aquarium.



frank wazeter
photographs by the author

very small scale, such as a rock outcrop in a stream bed with a beautiful fern growing out the side. Perhaps it might be (as is the case with my layout) something as simple as a patch of weeds growing out of a small stone outcrop.

Bringing that *sense* of nature (not literal interpretation) inspires a *feeling* of calm, as if there's something written in our DNA that makes us feel at ease experiencing such a thing. I have to reinforce this: The objective is not to create a literal recreation of something, nature or otherwise, but to capture its sense and express it.

Ask yourself which is more powerful: a literal interpretation of a mountain or the *feeling* of the experience of being on a mountain and walking among the forest or looking out on the world from its peak?

Getting Technical with the Layout

Now that you have gained insight of the process that goes into creating this kind of layout and understand the feeling of the desired end result, we can get down to some brass tacks.

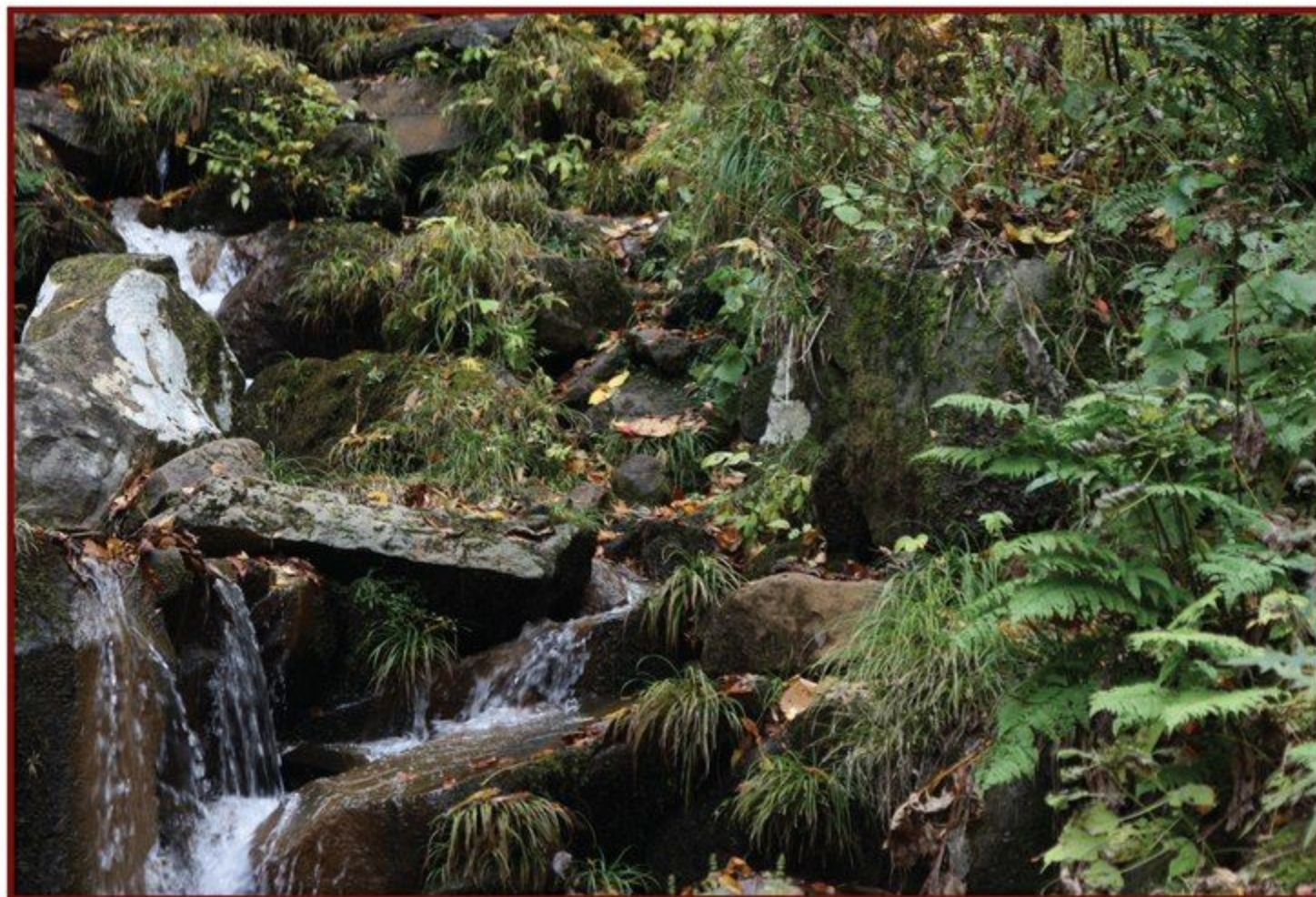
Since everything revolves around the impression the stones give, you want to select stones that have impact, character (i.e., are interesting to look at), and are arranged in a way that they will not be overtaken unintentionally by plants.

The basic premise is to have one main stone that serves as the central focal point of the entire layout. It is the main actor on the stage, and the supporting stones serve their roles as supporting actors that strengthen the story of the main character.

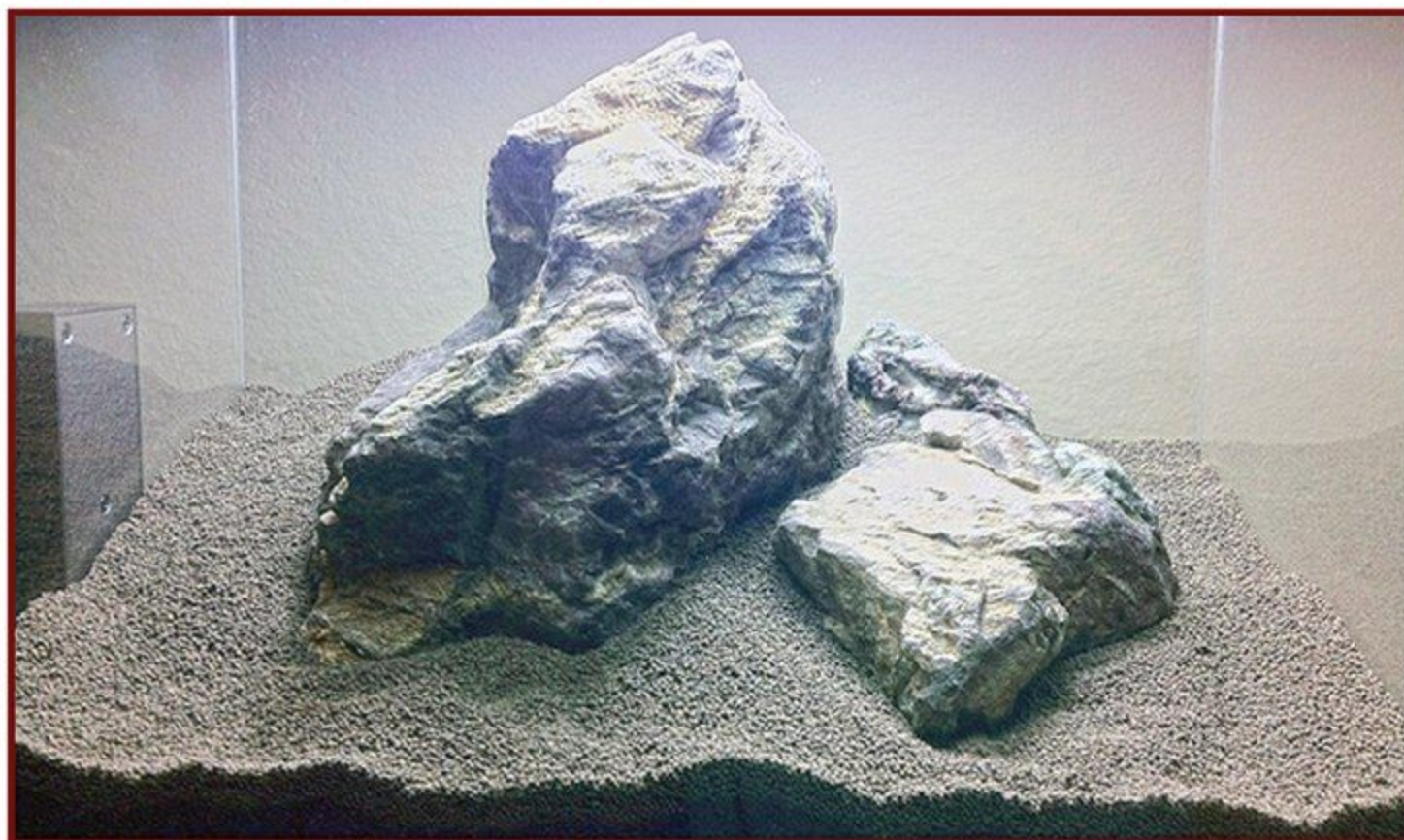
In this case, I wanted the main stone to be extremely dominant to express a feeling of stability, the ability to stand the test of time. In order to do that, the stone is placed fairly vertically (which gives the impression of strength and stability, as opposed to angles, which give a tension of instability to the layout). The stone has a great mass to it relative to the size of the aquarium, and its placement here dictates how the plants will ultimately play their role around it.

Placing the secondary stones (there are ultimately four supporting stones in this layout) serves an interesting purpose here. What I wanted to achieve was the feeling of a single rock. The secondary stones are intended to be covered largely by plant growth and obscured completely.

Now this may seem counterintuitive at first, but it is an extremely important role, as



■ One of the challenges of *iwagumi* is creating an impression of a natural landscape without relying on carbon copies of outdoor features.



■ A large stone set close to the center forms the focal point of the layout.

these stones end up creating natural division points for the plants and create texture in the layout as plants grow around them and complete the scene. This gives the layout, in the end, a sense of passed time—that the plants have been growing there for ages.

What you should pay attention to in the progression of these stones is the directions they face in comparison to the main stone and how they are positioned. Notice how each stone lines up with the main stone and creates a sense of flow, both going toward and away from the main stone.

This skeletal hardscape structure creates the initial impression that the layout will eventually follow. Though the majority of stones are intended to disappear into the

foliage, they are utterly crucial in creating the sense of layout here. Also take notice of the positioning within the aquarium and the odd numbers used—in brief, odd numbers break symmetry and inspire a more natural feeling, and the general ordering of placement of stones goes from largest (main stone) to smallest based on where you want the points with the strongest impression in the layout to be. One last point to take into consideration is the slope—a lower slope in front and higher slope in back creates a sense of depth. A flat substrate level across the whole layout would make the entire aquascape appear two dimensional, as opposed to the three-dimensional look that even a little bit of slope would add to the layout.



■ Smaller rocks are methodically placed around the primary stone to suggest a single, unified element and divide plant growth.

Wait! What About the Golden Ratio?

The golden ratio is a very classic ratio that states every layout should follow a proportion of 1:1.625 (or rounded up to 2:3 for aquarium ease). This essentially means you work in thirds, so each focal point is at the $\frac{1}{3}$ and $\frac{2}{3}$ mark of the total length of your aquarium.

The golden ratio is absolutely a formula to base your aquascapes on. Elements that are too centered will look artificial and distract from the natural focal point the eye follows. That said, however, in small aquaria, such as a nano aquarium, the rule kind of breaks down a bit.

Precisely following the 2:3 ratio in nano and pico aquarium sizes leads to the whole

layout looking disproportionate and gives you a real feeling of the true size of the aquarium. We want the layout to look much larger than it is! So in this case, the stone is placed fairly centered (although a little off-center), and the focal point will rest in where the plants will be growing.

This subtle move in layouts this small actually gives them a huge amount of dynamism that otherwise gets lost in precisely following the rules (to be fair, they are followed; they will just be shown through the application of plants later and not through stone work).

Next Up: Wabi Sabi and Plants

The next phase in the development of this layout will be the execution of planting the plants, how they are arranged, and how exactly a feeling of *wabi sabi* will be achieved. Until then, take some time and reflect on the basic principles described here and the previous article. The next step will be to start completing the final image of the layout—in other words, we'll be bringing it all together. 🐟

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A Look at the Velvet Finger Coral: *Montipora digitata*

The genus *Montipora* is a big one, with lots of species that are regularly available to hobbyists. In fact, it's the second largest genus of stony corals, with the ubiquitous genus *Acropora* being the only one with more members. Various species of *Montipora* can come in many growth forms, from plating to branching to encrusting, but I want to tell you about one of my favorite species this month, the branching *M. digitata*. This species is best known as the velvet finger coral or monti-digi, and it's a good one for sure. I like it so much that I can't really remember the last time I didn't have some of it growing in one of my aquariums.

The Adaptable *Montipora digitata*

This species of *Montipora* is called the velvet finger coral for two reasons. First, it is completely covered in relatively tiny polyps that are typically less than 1 mm in diameter, and actually looks rather fuzzy when they're all expanded from the skeleton. So, it could be said that it looks like it's covered in velvet I suppose. Secondly, it's one of the digitate (branching) species of *Montipora*, with each colony producing numerous thin branches that typically arise from an encrusting base.

Colonies of *M. digitata* come in several colors and various shades of those colors. For example, a common color is green, but green specimens can range from a washed-out light green to a medium-hued and rather fluorescent green to a deep green depending on environmental conditions. Likewise, I've had numerous colonies that started out red as could be, but, under different conditions in the same and different aquariums, managed to turn pink and sometimes orange. Or, it

has happened the other way around, with specimens changing from pink/orange to red. And, as is the case with the green ones, any of these colors can be lighter or darker depending on conditions. Other specimens may be dark to vibrant purple, blue, or teal.

Any of these can lose their nice colors and fade out or even turn completely brown under poor lighting and/or high-nutrient conditions. Moving them up in a tank where the lights are brightest (or getting brighter lights) and getting nutrient levels under control can correct this, and even the brownest of brown colonies will eventually get its pretty color back if conditions are improved. I've even bought some very cheap brown specimens in the past, just to see what they turned into in my stony coral tank, and I've never been disappointed.

Aside from their often-nice colors, these are also relatively hardy corals that are as tough as any other durable stony corals. Under less-than-optimal conditions they may not look their best, but they can survive just fine when brown. High nutrient levels often reduce their growth rates too, but they'll hang in there. And they can live long term on what would be considered very low-intensity lighting for a reef aquarium, so they're quite adaptable.

On the other hand, when everything is going well, these corals can be exceptionally fast growers. By that I mean they can easily be the fastest growing small-polyp stony corals you ever come across when happy and healthy. Many colonies, especially red/pink/orange and purple ones, will spread out over a surface as an encrusting growth at first, and you might not think much is going to happen. But at some point, they'll generally start to produce multiple little finger-like knobs that

James Fatherree, MSc, is a physical and environmental sciences professor in Tampa, Florida. He has been an aquarium hobbyist since childhood, a reef aquarium hobbyist for over 20 years, and has spent many days diving in Florida, Hawaii, the Bahamas, Japan, and Indonesia. In the past he has managed a large retail aquarium store, owned and operated an aquarium design, installation, and maintenance business, and spent a summer working for an aquarium livestock collector/wholesaler in Florida. James has also published numerous articles in the U.S. and Europe, and has written and illustrated several books on the topics of reef organisms and marine aquariums, the latest of which is *Giant Clams in the Sea and the Aquarium*.



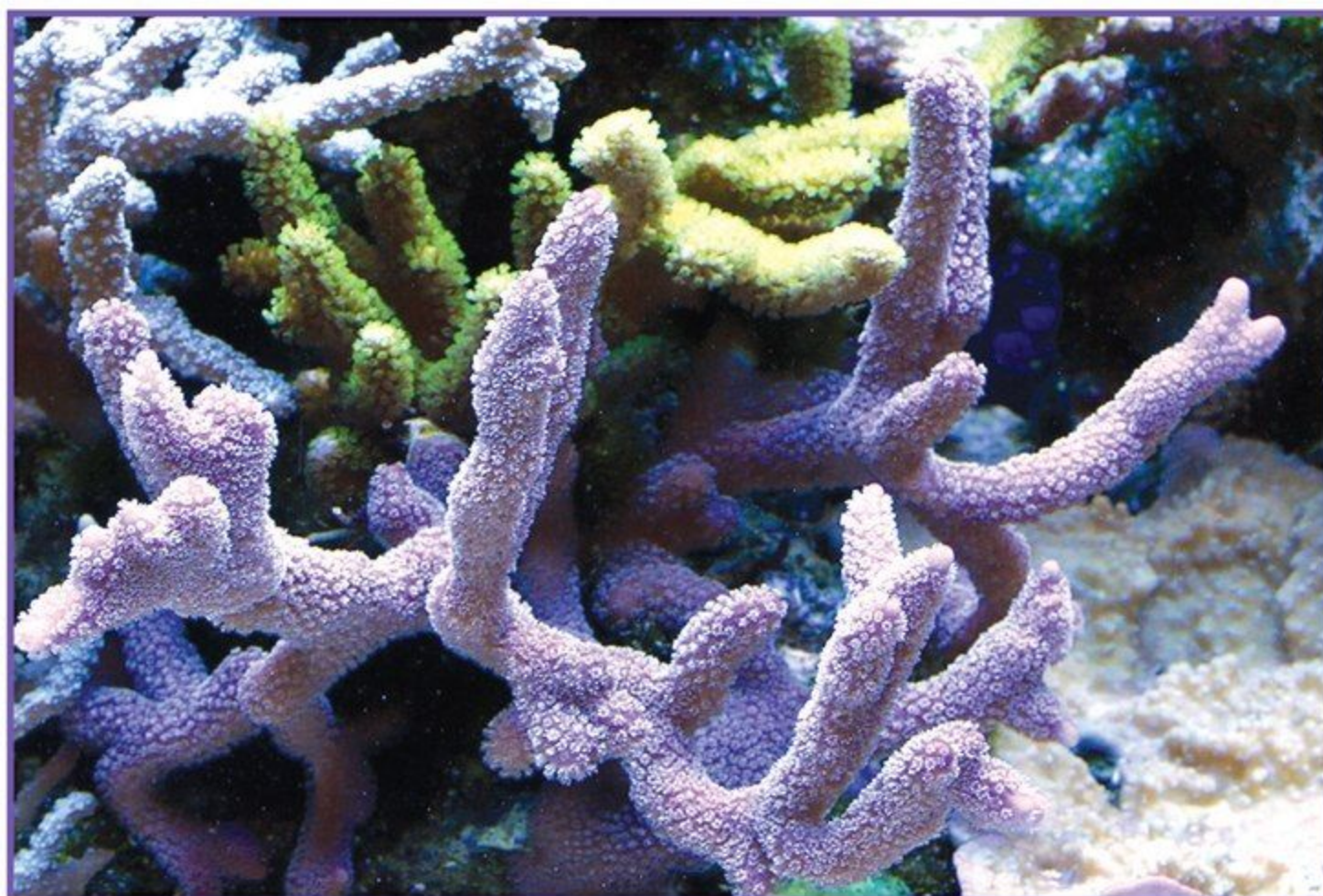
james fatherree
photographs by the author

arise from the encrustation and then quickly grow into full-size branches. These branches typically split a few times as they grow, too. A colony can go from nothing more than a rind on a rock to a full-fledged branching one in a relatively short time. It's also interesting to note that unlike the branches of many other stony corals, the branches of *M. digitata* typically stay fairly round and also stay about the same diameter from base to tip, with the fuzzy polyps covering every bit of the skeleton.

Challenges Keeping the Velvet Finger Coral

I do want to mention one exception that comes to mind. Over the years, I've had several colonies of green monti-digi, and they have all shared one habit that I don't care for. While every other color I've had could be easily mounted on a rock that it would soon start to grow over, the green ones never have. Green specimens tend to quickly produce lots of branches, but for whatever reason, it's practically impossible to get a colony to spread out at its base and grow over the epoxy I've used to fix them in place, much less the rock they were stuck on. Keep that in mind if you plan to place any specimens somewhere in an aquarium where the epoxy is visible and would become an eyesore if it never gets covered up. In an attempt to force some encrusting growth from a green specimen, I even took some branches off and epoxied them in a horizontal/flat position on top of a rock. Even that didn't work well, as the fragments only partially covered the epoxy and then started producing vertical branches. The real problem with this (other than looks) is that a colony can get pretty big over time, and with no sturdy/appropriate base of attachment, they tend to eventually break off. It doesn't kill them or anything like that, but it is annoying when you have to try to re-attach a large specimen with a rather tiny base—without breaking off a bunch of branches and/or making a mess in the process.

Now speaking of breaking branches, I've got to bring up the velvet coral's biggest con. As good as they may look and as fast as they may grow, you have to be very, very careful when handling specimens or working around any of them in an aquarium. These are the most fragile stony corals I can think of, and their branches will break off with even the slightest bump. You can easily demolish a specimen when trying to affix



■ Purple and green colonies of the velvet finger coral (*Montipora digitata*).



■ Red colonies of the velvet finger coral can really change colors, going from red to pink or orange depending on conditions.

it to a rock, and I've accidentally knocked off more branches than I care to remember just cleaning my aquariums. Fortunately, they grow back quickly and the knocked off branches can be used to start new colonies if you choose.

When it comes down to it, I'm thinking that the weakness of their skeleton is a biological trade-off for their rapid growth rates. The skeleton is exceptionally lightweight and porous, so growing a whole new branch really requires very little skeletal material. The skeleton is mostly empty

space, so it seems this species has traded speed for durability.

Other than that, I should also mention that these corals won't put up much of a fight against other encroaching stony corals. I certainly haven't tested every possible conflict that could happen in an aquarium, but as best as I can tell, they'll lose any fight with any other coral. This means you should always be mindful of where a specimen is placed and be ready for damage if another coral is allowed to grow too close. Of course, pretty much all corals are subject to damage from some coral or another.



■ This purple colony completely encrusted the rock it was affixed to and has started producing numerous small branches, which are bound to get bigger quickly.

Oddly enough, different-colored specimens will burn each other too, despite being the same species. While damage may be restricted just to the spots where branches of two different-colored colonies come in contact with each other, there will be damage nonetheless. You may have to do some occasional pruning if you

have different-colored colonies growing close to each other. Again, that's nothing unique to this species.

In case you're curious, while I won't swear by it, I believe green always wins out over the other colors. Red/pink/orange beats purple, blue/teal, and brown. Purple beats blue/teal and brown.

And, blue/teal beats brown. It's tough to be brown.

General Care Requirements

Also note that, while I just said they're hardy corals, if you expect any of them to thrive and look their best, you'll always need to pay particular attention to alkalinity and calcium. Alkalinity should be kept between 7 and 12 dKH while calcium should optimally be kept at 380 to 450 ppm if you expect the rapid growth I keep bringing up. Likewise, you'll need to keep nutrient levels as low as possible by any means necessary.

Lighting is pretty easy, though, as I've seen many colonies in everything from waters that were relatively dimly lit and often turbid to waters that were shallow, crystal clear, and brightly lit. So, given some time to adapt, I don't think you have to worry about over-lighting any of them, regardless of color.

Water flow should be moderate and turbulent for any of them, too. If too low, detritus will settle on their encrusting bases, especially in crannies between branches. So, be sure to provide enough flow to keep them cleaned off, as the accumulation of detritus in

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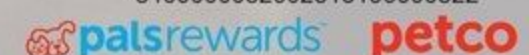


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any area can lead to tissue loss. Conversely, currents that are too strong will prevent colonies from expanding their polyps.

The Monti-Eating Nudibranch

Okay, the last thing I want to tell you about is the dreaded monti-eating nudibranch (*Embletonia* spp.). This particular nudibranch

(sea slug) is tiny and hard to spot, can reproduce very quickly, and feeds on various species of *Montipora*. I've had an infestation of them before, and they can be devastating.

These nasties produce practically invisible egg masses around the bases of *M. digitata* colonies, which give rise to dozens of slugs that typically start eating the polyps at the base of a colony and then work their way up. In doing so, they can

strip a colony bare in a matter of days and can also spread around a tank in no time at all. Once they're in an aquarium, they can last for weeks without eating any corals, too.



■ It's important to remember that essentially any other stony coral can beat up on monti-digs, and while there may be exceptions, I don't recall ever seeing one.



■ Look closely and you can see a few of the frilly and blotchy monti-eating nudibranchs (*Embletonia* sp.).

The one time I had them in one of my tanks, I had taken some coral specimens from a friend with a healthy aquarium and figured there was no need to put them into a quarantine tank. I regretted that decision for a long time, though, as I had a heck of a time getting rid of the slugs and lost several corals. I tried various suggestions to eliminate them but ended up figuring out that nothing at all worked like a soft-bristled toothbrush and the addition of a yellow coris wrasse.

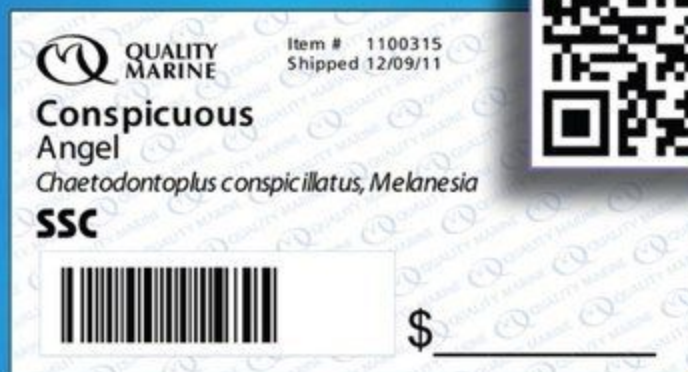
I removed some colonies and scrubbed them clean. These were then put into a quarantine tank and watched for weeks. Several times I would find that I'd missed some eggs and the slugs would show up again, but I finally got rid of them all. I really didn't want to pull out some others, though, so I scrubbed them as best as I could in the aquarium and let the fish get to work on whatever I missed. It was actually quite nice watching the colorful yellow coris swim from coral to coral and nip up whatever slugs it could find. So, between the scrubbing and the fish, I finally got the job done, and I also learned my lesson about quarantine. I did save most of the corals too, but only after a lot of hassle. So, don't make the same mistake I did if you decide to try *M. digitata*. 🐡

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Creating an *Unzan-Seki* Stone Layout That Can Be Enjoyed for a Long Time

Takashi Amano translated by Tomoko Schum



Takashi Amano

■ The layout was produced by considering the routine and long-term maintenance work, such as the spacing of the stones and the types of aquatic plants.

There are many ways to enjoy aquatic plant layouts. Therefore, many types of layouts are submitted to the International Aquatic Plants Layout Contest every year. In recent years, many diorama-style layouts, which depict natural scenery realistically in an aquarium, are submitted to the contest. Various scenes, such as mountains and forests, are featured in them. From these layouts that are cleverly created with fine details, using not only aquatic plants but also stones, driftwood, and sand, I get a certain collective impression.

It seems to me that it is difficult to maintain such a layout. Although a very intricate aquatic plant layout in the diorama style requires a creative idea, an artistic sense, and dexterity, it would not be

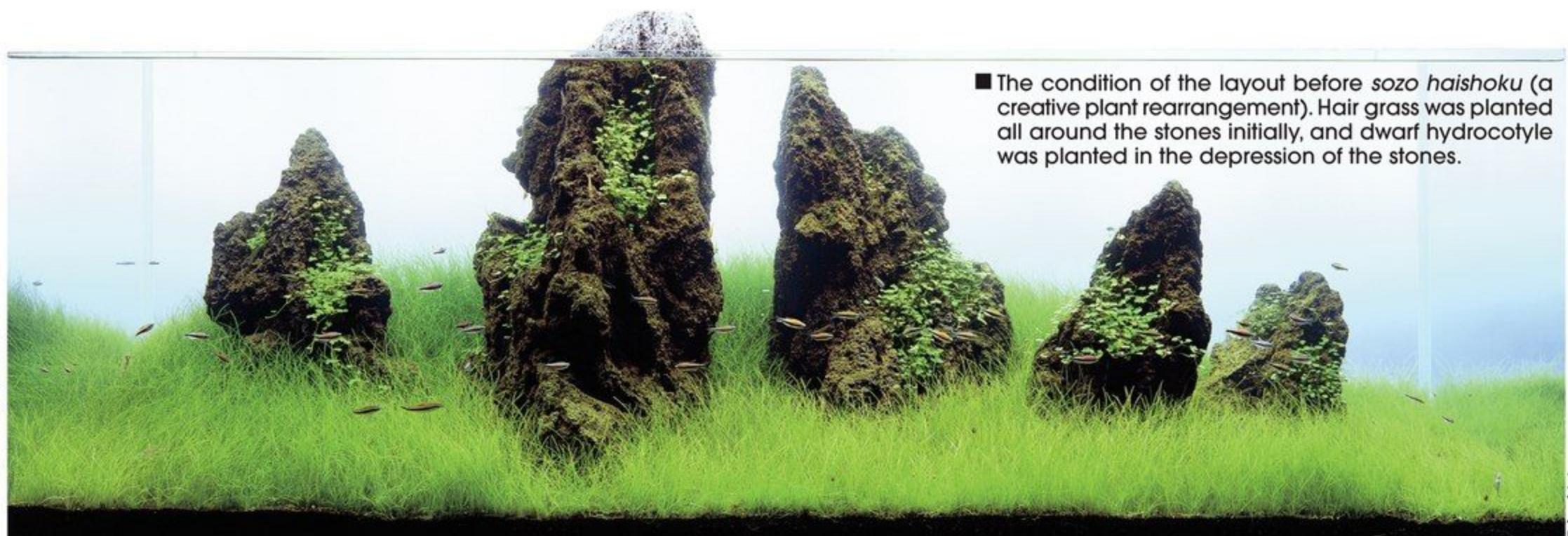
attractive aquascape. Realistically, it would be difficult to perform such maintenance work in a diorama-style layout due to its fine, detail-oriented use of aquatic plants. It seems to me that it is a rather short-lived layout that is remade shortly after photographing. My experience over the years tells me that diorama-style layouts with such fine details cannot be maintained exactly as they are for a long period of time.

Easy-to-Maintain Layouts

Nature Aquarium layouts that are introduced here every month are also created in the image of natural scenes. However, they are created as aquascapes for fish to live in instead of as diorama-style scenes. These layouts are created by considering the condition with fully grown, dense aquatic plants, rather than

The framework of a composition is created securely with stones and driftwood, and aquatic plants are planted with care in order to make easy maintenance possible. While doing so helps the layout appear delicately put together, it enables the overall composition to stay intact throughout repeated trimming and replanting of aquatic plants. Because stones, driftwood, and aquatic plants are arranged with such fine details in a diorama-style layout, the composition is easily spoiled when work is performed to maintain the scene.

In the Nature Aquarium, fast-growing plants and slow-growing plants are used intentionally in certain ways and arranged in appropriate locations to minimize the maintenance work. While the majority of undergrowth plants used in the foreground are fast-growing, heliophytic plants, they are



■ The condition of the layout before *sozo haishoku* (a creative plant rearrangement). Hair grass was planted all around the stones initially, and dwarf hydrocotyle was planted in the depression of the stones.

difficult to finish in a relatively short period of time, from just a few weeks to one or two months. However, it would be quite difficult to maintain for a few months to a few years. Since aquatic plants grow, they must be trimmed or replanted to maintain an

a state created right after planting, and the method to maintain such a condition. Although it appears to be created with fine details, a Nature Aquarium layout is produced in such a way that makes it easy to maintain.

planted in an open space where they can be trimmed easily. In an area where driftwood branches are crossed in a complex manner and make the trimming of plants difficult, slow-growing sciophytic plants are grown to reduce the frequency of the trimming work.



■ The layout after the *sozo haishoku*. The layout appears more natural than the previous one and more powerful as well.

Takashi Amano

shi Amano



■ An iwagumi layout with unzan stones and *Hygrophila pinnatifida* in a fresh, new style that takes advantage of the epiphytic nature of *H. pinnatifida*.

Even if driftwood or other aquatic plants cast some shadows on sciophytic plants, these plants grow without any problem due to their shade-tolerant nature.

A Long-Lasting Layout

The layout in this article was produced to be enjoyed over a long time using *unzan* stones. *Unzan* stones are produced from natural lava rocks and are processed to be used easily in an aquatic plant layout. An *iwagumi* layout can be produced easily by arranging a few of them in an aquarium. A few depressions are made on the stones to hold some *wabi-kusa*. A different *iwagumi* expression can be created by placing dwarf hydrocotyle or *Hygrophila pinnatifida* into the depressions. *Wabi-kusa* can easily be replaced with another one as well. A major characteristic of this layout is the ample space provided around each *unzan* stone for the ease of trimming or replanting of aquatic plants.

The layout was planted initially with hair grass and dwarf hydrocotyle. After

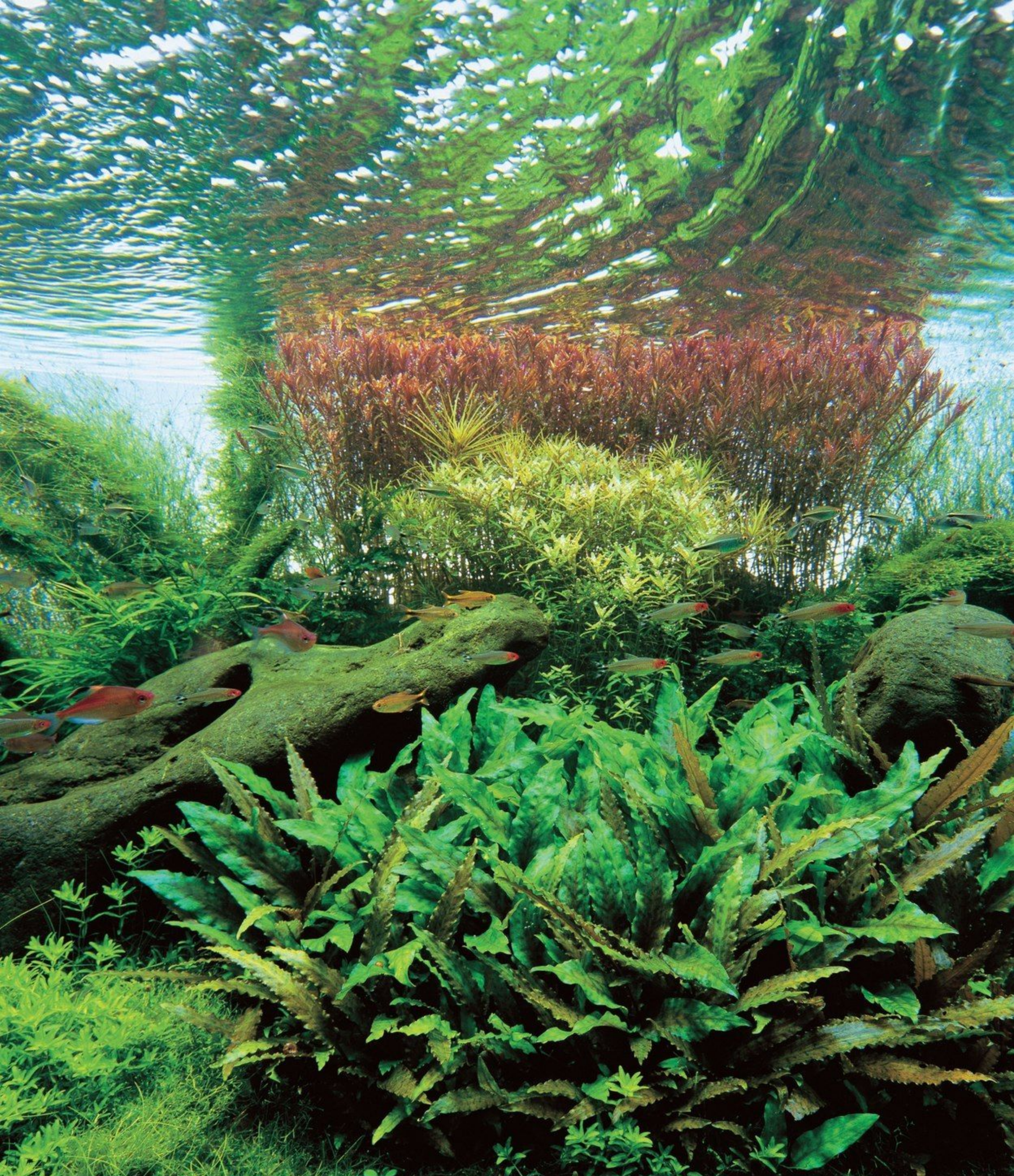
about half a year or so, the planting was changed to the way it appeared in the main photograph. After another half year, *Eleocharis vivipara* in the background was pulled out and replaced with *Glossostigma*.

Although *E. vivipara* is usually maintained by removing the plantlets that form at the tips of its leaves, it needs to be replaced eventually since its roots tend to loosen after some time. Although the layout could be maintained in the same condition simply by replanting the same plants, the plants were replaced with different ones in order to enjoy various different layout patterns.

Since the *Riccia* and *Glossostigma* in the foreground and the *Hygrophila pinnatifida* in the *unzan* stones were left as they were, although aquatic plants were replaced partially, the overall impression of the layout appears tranquil and unchanged over a long period of time. In order to enjoy a layout for a long time, it is important not only to select composition materials and aquatic plants carefully, but also to replant plants in a timely manner or replace aquatic plants with appropriate ones. Changing the impression slightly by doing so is also a key point for enjoying a layout for a long period of time. 🐟

DATA

Aquarium: Cube Garden W180 x D60 x H60 cm
Lighting: Grand Solar I (NAG-150W-Green x 1, NA PC lamp 36W x 2) x 3 units
Filter: Super Jet Filter ES-2400 (Bio Rio L, NA Carbon)
Substrate: Aqua Soil Amazonia, Power Sand Special L, Bacter 100, Clear Super, Penac W/for Aquarium, Penac P, Tourmaline BC
Additives: Brighty K, Green Brighty STEP2
CO₂: Pollen Glass Beetle Series 50 mm, 6 bubbles per second via CO₂ Beetle Counter (using Tower)
Aeration: For 14 hours after the light is turned off using Lily Pipe P-6
Water Change: 1/3 once a week
Water Quality: Temperature 25°C (77°F), pH 6.8, TH 20 mg/l
Aquatic Plants: *Hygrophila pinnatifida*, *Eleocharis vivipara*, *E. acicularis*, *Riccia fluitans*, *Glossostigma elatinoides*
Fish/Invertebrates: *Nematobrycon palmeri*, *Otocinclus* sp., *Caridina japonica*
 [Note: The hardware itemized above represents the author's specific choices; equivalent results may be obtained with other equipment and accessories—Eds.]



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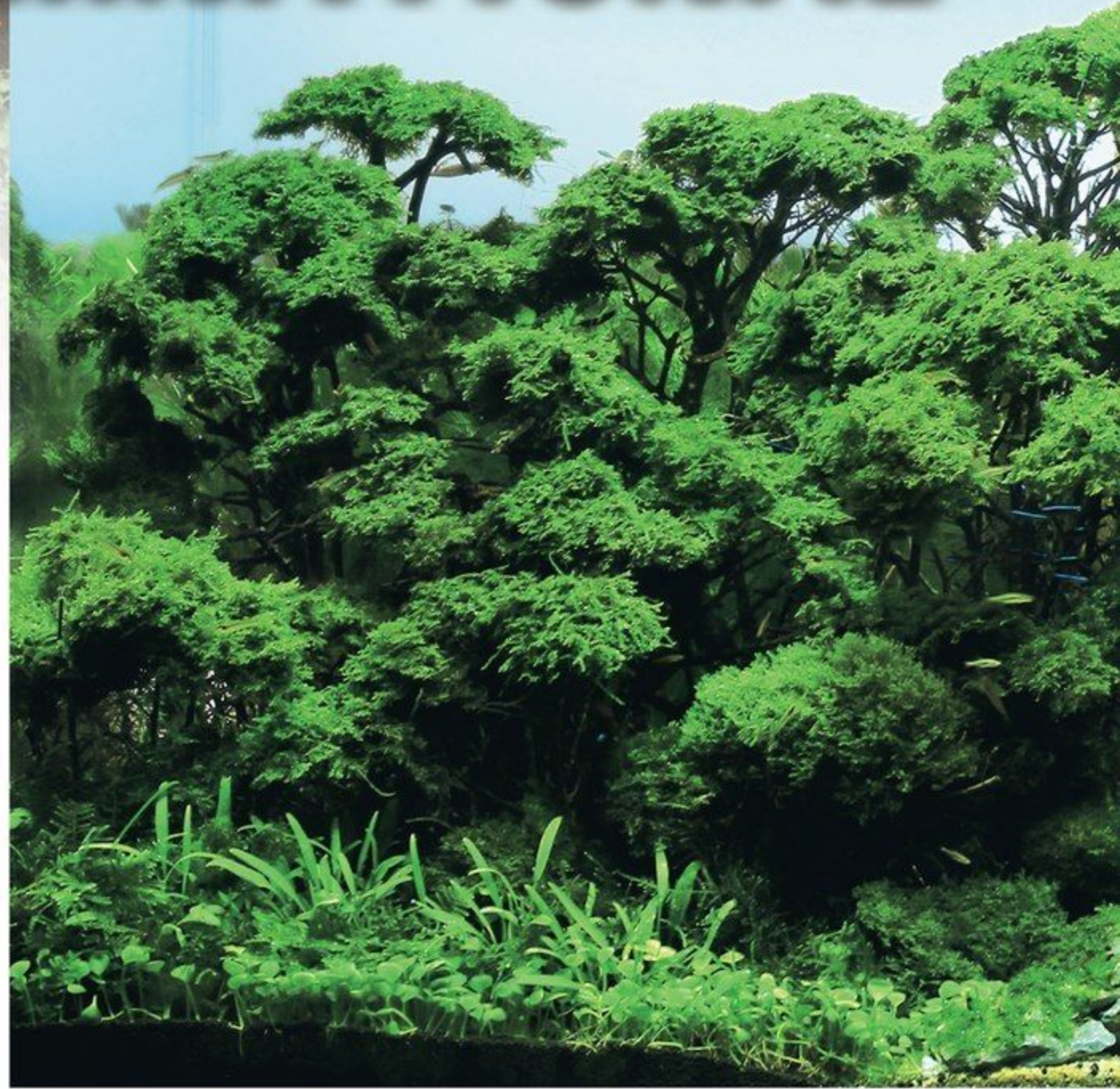
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Grand Prize
World Ranking #1
Zhang Jianfeng
CHINA
Title: Amazon

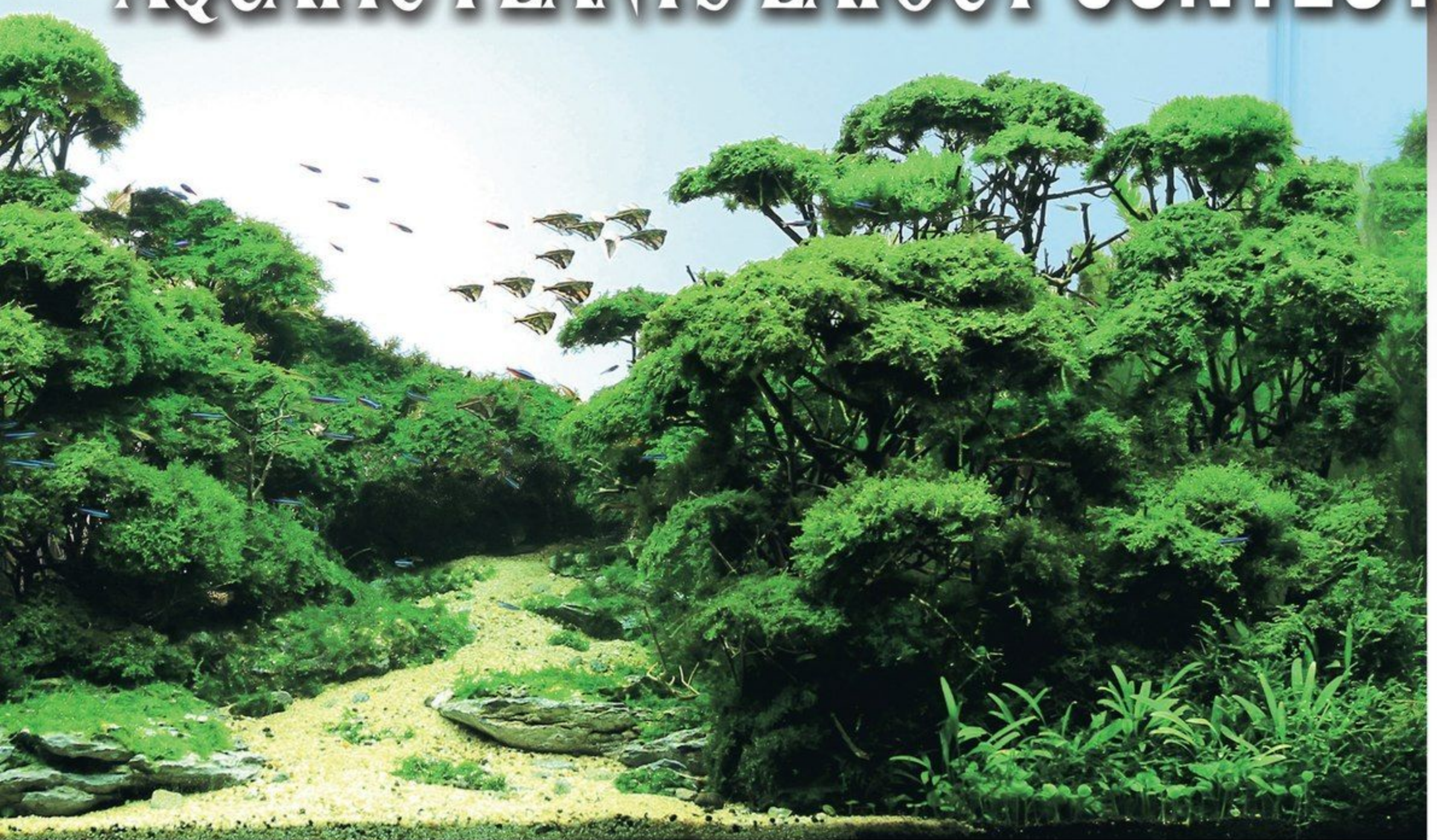
Dimensions: W120 x D50 x H50 cm (W50 x D20 x H20 inches)
Aquatic Plants: *Riccardia chamedryfolia*, *Marsilea crenata*, *Cryptocoryne parva*, *Vesicularia* sp., *Fissidens nobilis*
Fish & Invertebrates: *Carnegiella strigata fasciata*, *Paracheirodon simulans*, *P. axelrodi*, *Caridina japonica*
Evaluation: This year's grand-prize-winning layout resembles the tropical rainforest of the Amazon, as its title states. In the past, there were many layouts with an expression of trees using driftwood and mosses, but what makes this layout special is the realistic expression of canopies of a tropical rainforest, which consisted of many trees. We see the creator's high technical skills in the canopies created by the skillful arrangement of twiggy driftwood and mosses. The presence of white sand in the center and arrangement of stones placed on both sides also contributed to create natural tropical rainforest scenery. The selection of fish and the timing of the photograph are just perfect, and this layout deserves the honor of grand prize.



Gold Prize
World Ranking #2
Siak Wee Yeo
MALAYSIA
Title: Gratefulness

Dimensions: W140 x D60 x H50 cm (W55 x D25 x H20 inches)
Aquatic Plants: *Limnophila* sp. "Vietnam," *Anubias barteri* var. "nana petite," *Staurogyne repens*, *Fissidens fontanus*, *F. nobilis*, *Hemianthus callitrichoides* "Cuba," *Bolbitis heudelotii*, *Microsorium pteropus* "narrow," *Glossostigma elatinoides*
Fish: *Hemigrammus rodwayi*, *Nannostomus eques*, *Puntius denisonii*, *Crossocheilus siamensis*, *Otocinclus* sp.
Evaluation: The aquarium layout with a unique natural look and beauty from Malaysia won the gold prize. The driftwood and ferns resembling a thick primeval forest, beautifully grown mosses, and the white sand, which makes a perfect contrast with the aquascape, are all effectively arranged here. Together they describe a unique natural beauty. The narrow path or stream in the center, created by the white sand extending from the back space to the foreground, is also very effective and adds a depth and power

AQUATIC PLANTS LAYOUT CONTEST



Silver Prize
World Ranking #3
Long Tran Hoang
VIETNAM

Title: *Green Convergence*

Dimensions: W220 x D65 x H65 cm (W85 x D25 x H25 inches)

Aquatic Plants: *Microsorium pteropus* "needle leaves," *M. pteropus* var., *Marsilea hirsuta*, *Hygrophila pinnatifida*, *Glossostigma elatinoides*, *Eleocharis acicularis*, *Taxiphyllum* sp., *Rotala rotundifolia* sp. "orange," *R. rotundifolia* sp. "yellow"

Fish & Invertebrates: *Boraras maculatus*, *Caridina multidentata*, *Atyopsis moluccensis*

Evaluation: The first silver-prize-winning layout from Vietnam had a sensational impact. By directing the pointed stones toward the vanishing point, it created a visual effect like one-point perspective. Exaggerated perspective and powerful stone arrangement make this layout sensational. Even aquatic plants are meticulously arranged in detail. However, depending on how you look at it, the outcome of evaluating this kind of unrealistic expression can change. In this sense, this is one of the most remarkable layouts in this year's contest.



Silver Prize
World Ranking #4
Song Pin Chen
TAIWAN
Title: Forest Impression

Dimensions: W105 x D60 x H60 cm (W40 x D25 x H25 inches)

Aquatic Plants: *Anubias* sp., *A. barteri* var. "nana petite," *Hydrocotyle sibthorpioides*, *Microsorium* sp., *Taxiphyllum barbieri*, *Vesicularia* sp., *Riccardia chamedryfolia*

Fish & Invertebrates: *Paracheirodon axelrodi*, dwarf puffer, *Ancistrus* sp., *Caridina japonica*

Evaluation: Creating a forest scene by arranging driftwood in upright position has already been a standard layout technique, but this required more sophisticated skills. Mr. Chen created a layout with a strong perspective and power by using different sizes of driftwood in the foreground and background, and having steep substrate slopes and white sands in the center. Different kinds of aquatic plants were planted in detail, and an image of a stream running through the primeval forest is skillfully created by arranging pebbles, mosses, and ferns in the aquarium layout.



Bronze Prize
World Ranking #5
Yutaka Kanno • JAPAN
Title: Ray of Sunlight
in the Cave

Dimensions: W120 x D45 x H45 cm (W50 x D20 x H20 inches)

Aquatic Plants: *Rotala* sp. "Nanjenshan," *R. rotundifolia*, *R. rotundifolia* "green," *R. macrandra*, *Hemianthus callitrichoides* "Cuba," *Eriocaulon* sp., *Hydrocotyle verticillata*, *Ranunculus inundatus*, *Vesicularia* sp., *Fontinalis antipyretica*, *Riccardia chamedryfolia*

Fish & Invertebrates: *Axelrodia* sp., *Caridina japonica*

Evaluation: The first bronze-prize-winning work is a very impressive layout with a challenging stone arrangement. The way stones in the upper side are overhanging may not be easy to understand at the initial sight, but from the layout title, one can understand the creator tried to make an image of a rock cave, looking from the inside. In addition to the use of stones and white sands, the photography technique, emphasizing the strong contrast between the dark shadows of rock caves and outside bright lighting, made this layout very impressive. It is regrettable that upper overhanging rock made an oppressive impression.



Bronze Prize
World Ranking #6
Duc Viet Bui • VIETNAM
Title: Where Life Begins

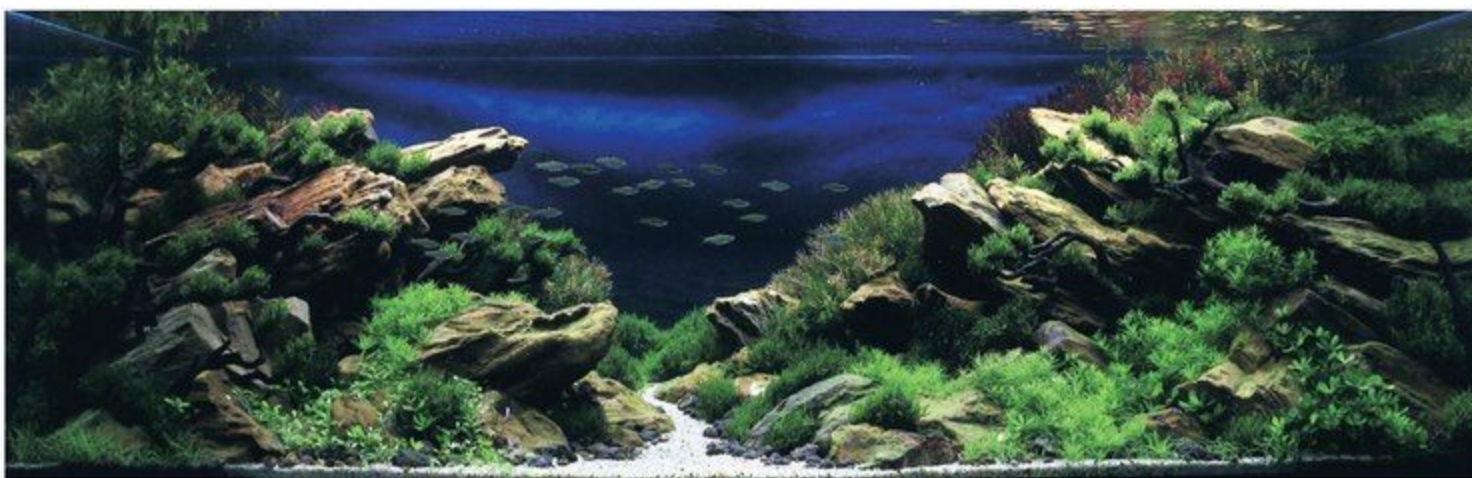
Dimensions: W120 x D60 x H50 cm (W50 x D25 x H20 inches)

Aquatic Plants: *Isopterygium* sp., *Vesicularia ferriei*, *V. montagnei*, *Cryptocoryne beckettii* var. "petchii," *Hygrophila polysperma* var. "rosaenervis," *Marsilea hirsuta*, *Anubias barteri* var. "nana petit"

Fish: *Boraras* sp.

Evaluation: The second bronze prize went to the layout from Vietnam with an impressive use of driftwood and mosses. An image of dense forest was created by arranging driftwood in an overhanging way and attaching mosses to it. The dark impression created by the use of black driftwood and many dark green sciophytic plants is offset by the use of white sand in the center, for making an image of a narrow stream. As a whole, therefore,





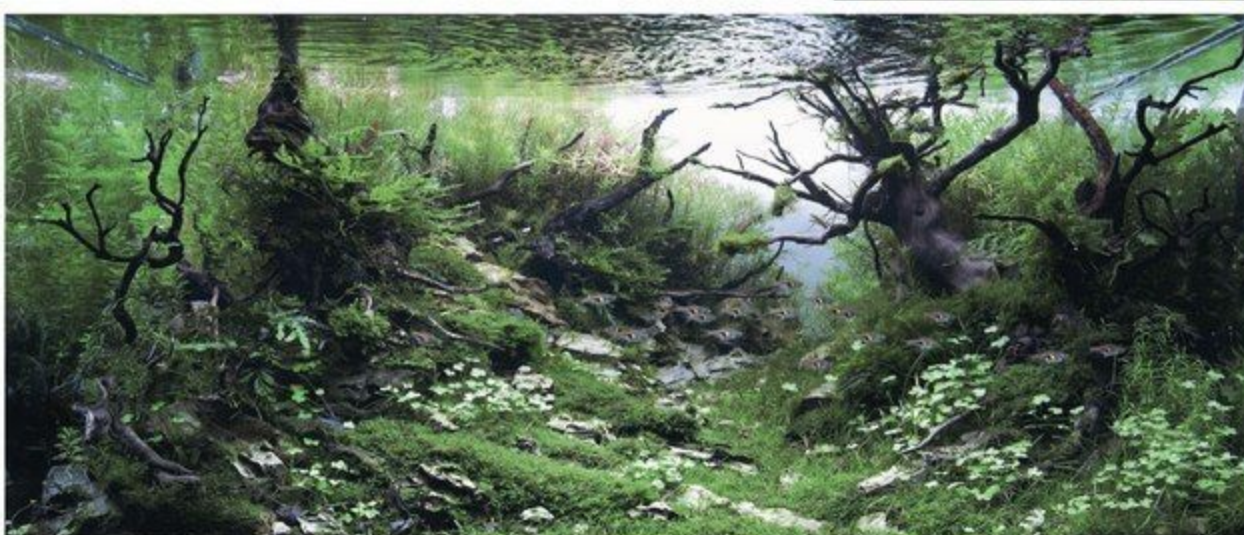
Bronze Prize
World Ranking #7
Truong Thinh Ngo • VIETNAM
Title: Somewhere in the World

Dimensions: W120 x D45 x H40 cm (W50 x D20 x H15 inches)
Evaluation: The last bronze-prize-winning layout is also from Vietnam, with a very impressive arrangement of stones. A unique natural feeling is created by setting up many stones and planting aquatic plants in the space between the stones. The small trees created by inserting driftwood covered with moss between the stones also became an effective accent of the layout. The composition is well organized in a panoramic size aquarium tank. The creator well maintained the white sand and aquatic plants, and it gives us an impression that the work was created with the greatest care.



World Ranking #8
Chee Keong Teoh • MALAYSIA
Title: The Root

Dimensions: W120 x D45 x H45 cm (W50 x D20 x H20 inches)
Evaluation: The driftwood looking like a root of a tree is boldly arranged in this layout and gives the impression that aquatic plants are growing in a cluttered way at the initial sight. But it looks natural and brings more of the driftwood's characteristics. Despite the use of large driftwood, the compositional balance is well organized due to the large open space.



World Ranking #9
Diego Marinelli • ITALY
Title: One Too Many Mornings

Dimensions: W90 x D60 x H50 cm (W35 x D25 x H20 inches)
Evaluation: Perspective is created well, utilizing the aquarium tank with a depth. By making a mound of stones and driftwood, the creator made an image of a valley extending toward the back and created a layout with perspective and power. The planting of *Hydrocotyle* and mosses also emphasized naturalness.



World Ranking #10
Xuan Thuy Nguyen Thi • VIETNAM
Title: Autumn Dream

Dimensions: W120 x D40 x H40 cm (W50 x D15 x H15 inches)
Evaluation: This is the layout created with uniquely shaped driftwood and stones. The color contrast of vivid red *Rotala* sp., deep green mosses, and white sand made a striking impression. Driftwood branches extending from both sides of the aquarium make an arch and emphasize the open space in the center.



World Ranking #11
Toshifumi Watanabe • JAPAN
Title: Gliding Over the Green Valley

Dimensions: W90 x D45 x H45 cm (W35 x D20 x H20 inches)
Evaluation: Although the layout is composed with only stones, mosses, and white sand, it made an unprecedented unique impression. The hill with a gentle curve adds a new dimension to the aquarium layout, and the cliff in the front gives an accent to the aquarium layout. The position of fish dwarfed in the background is also interesting.



World Ranking #12
Wang Chao • CHINA
Title: Tree of the Soul

Dimensions: W120 x D55 x H50 cm (W50 x D20 x H20 inches)
Evaluation: Big driftwood is arranged boldly in this layout, and it gives the impression of being in a primeval forest. The twigs and roots of aquatic plants look like vine plants, and they became elements providing a sense of nature to the aquarium layout. The open spaces between the driftwood are also effective.





Book Excerpt:

An Informative Guide to

Breeding & Raising Angelfishes

Ed Stansbury

Chapter 3: Genetics

The reproductive process is complex, but the end result is easy to understand. Each adult begins with two sets of chromosomes in each cell. However, in the reproductive cells, the chromosomes separate into two groups of chromosomes, with each set going to a different egg (or sperm).

Chance decides which eggs (or sperm) get the first set, and which eggs (or sperm) get the second set. The fertilized egg then combines $\frac{1}{2}$ of the chromosomes from the female parent, and a different $\frac{1}{2}$ from the male parent to yield the correct total.

Phenotypes

Phenotype refers to how an organism looks, while genotype refers to the genetic instructions an organism carries in its chromosomes. Identical twins are identical genotypes, yet the growth process, environment, and experience changes them ever so slightly so that they never look perfectly identical. These differences in appearance are phenotypic differences. When you look at two different kinds of angelfish, you are seeing phenotypic displays. For simplicity, I will use the terms type, kind, variety, line, and strain to mean major commercially important differences among angelfish.

The list of different kinds of angelfish phenotypes with which I have had some experience includes silver, silver veil, marble, marble veil, gold, gold veil, blushing, blushing veil, black lace, black lace veil, black, black veil, smoky, smoky veil, ghost, ghost veil, zebra, zebra veil, leopard, leopard veil, clown, and clown veil.

Gene Interaction

When we see any trait, we know that it appears because of the interaction of these two sets of chromosomes, and more precisely, because of the interaction of at least two genes for that trait, one gene coming from each of the parents. (Sometimes, groups of genes interact, adding their effects. The amount of black on mollies or the black tail/peduncle colors in platies are the results of this additive effect of different genes). All of the traits explained below are the result of two interacting genes.

It is how these two genes interact that ultimately dictates how the young

will look. One gene may be dominant, dictating the appearance of the young, or one gene may be recessive and therefore unable to control the other gene and remain hidden from view. Another case would be where the two genes may average each other out (This is called incomplete dominance and the young showing traits that are intermediate between the two genes).

Veilness in angels is a dominant trait that shows incomplete dominance. An individual with one veil allele of its two has a long, veil fin. This mixed genetic condition is called the heterozygous condition: the heterozygote has one veil and one non-veil allele. If the individual has two veil alleles, it is a homozygote, and has a doubly-long, flowing tail that is clearly bigger than the heterozygote. The homozygous-non-veil always has short fins. Both the heterozygote and the homozygote veil show long fins, with the homozygote having longer fins.

In order to visualize how the genes are passed from generation to generation, the Punnett square is used. This is a diagram developed by the geneticist, Dr. Punnett. With it, you can easily follow all the simple crosses, predict the

outcomes, and even set up the crosses that yield the results you need.

The Punnett Square

This simple diagram allows us to cross genotypes and to predict the phenotypes of crosses.

	1	2
3	4	5
6	7	8

A basic Punnett square.

The Punnett square above is labeled with 'parent genotype' at the top horizontal edge and the left side vertical edge. The various numbered areas are filled in with symbols showing a particular genetic trait. So areas marked 1 and 2 are reserved for the symbols representing two genes for a trait from one parent, and the areas marked 3 and 6 are reserved for the same trait from the other parent. Squares labeled 4, 5, 7, and 8 will show us the combinations possible. All of these combinations will



Both of these silver angels have the veilness gene. The specimen on the left is heterozygous for veilness while the specimen on the right is homozygous for veilness. This is expressed phenotypically by the length of the tail and the slightly longer fins.

be seen in some young. Once we see what combinations will occur (these are genotypes), it is easy to deduce what phenotypes we will see. After the first example, the labeling will be dropped.

How to Use Punnett Squares

The same simple Mendelian patterns apply to all fish. Similar Mendelian patterns of inheritance are seen in all living things, with some weird twists thrown in for good measure. Angelfish traits are easy to learn with because all of the simple color and fin inheritance follows Mendelian patterns.

ALLELES

Alternate forms of a genetic trait are called alleles. There are two alleles for fin length in angels: veil and non-veil. Every fish has many pairs of chromosomes in its cells, but only one pair of chromosomes carries the genes for fin length. On these two chromosomes there are genes. One gene only on each chromosome carries genetic information that dictates fin length. These two genes determine fin length in each of the young.

Many other recognizable phenotypes are combinations of characters, or a doubling of characters, and are mentioned in the following section on genetics, while other varieties that are not in the normal commercial trade are omitted.

Genes for Wild-Type Parent X Genes for Veil Parent

The example below shows a Punnett square with a doubly-veil parent (in the two chromosomes carried by this parent, both genes are causing veilness) crossed with a wild-type (Wild-type simply means that the trait is the one found in

	1 V	2 V
3 v	4	5
6 v	7	8

The capitalized letter "V" in areas 1 and 2 means that the gene for veilness is a dominant gene. The small "v" in areas 3 and 6 stands for a recessive wild type trait.

naturally occurring wild populations. It does not mean the fish is wild caught).

How can there be two veil traits? Where do these alternate forms come from? The recessive "v" is the condition found in the wild. The "V" is a mutation discovered among a tank of wild-type silver angels in the early 1950s. It is likely that this mutation has occurred in nature too, but perhaps the long fins made it easier prey, and consequently they didn't survive to reproduce in nature.

Cells numbered 4, 5, 7, and 8 are filled in by combining each gene from each parent with each gene from the other parent. Fill in cell 4 with a "V" donated by one parent and a "v" donated by the other. Fill in the other cells the same way. Thus, cell 5 is a combination of area 2 and 3. Cell 7 is the combination of 1 and 6.

	1 V	2 V
3 v	4 Vv	5 Vv
6 v	7 Vv	8 Vv

Here is the square filled in. Since each parent can only donate one gene for any trait to each of its young, which of its two genes gets donated? Both get donated, one gene to 1/2 of eggs (or sperm), and 1/2 to the other eggs (or sperm).

So what did we find out from this cross? All of the young received a dominate "V" gene and a recessive "v" gene. All of the young, having the same genotype must look identical with respect to veilness. Also, since the veil trait is dominate over the recessive wild-type, all the young will be veiled.

Each adult in this previous cross is homozygous for a trait, meaning each parent had only one allele to donate: each one was pure for that trait. One parent was homozygous dominant, and one was homozygous recessive for veil.

Regardless of what the trait is, the results from a homozygous dominant and a homozygous recessive cross is ALWAYS 100% heterozygous (mixed) genotype and 100% dominant phenotype. Genetically mixed, but all showing the dominant trait.

What will be the result from a cross between a homozygous marble and a wild-



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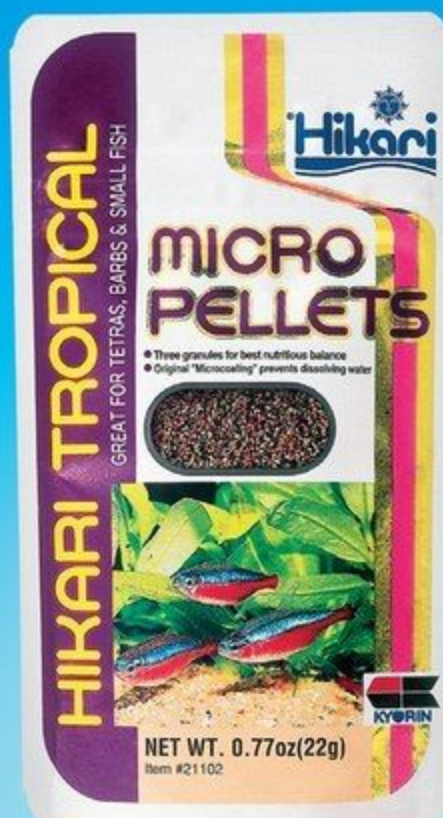
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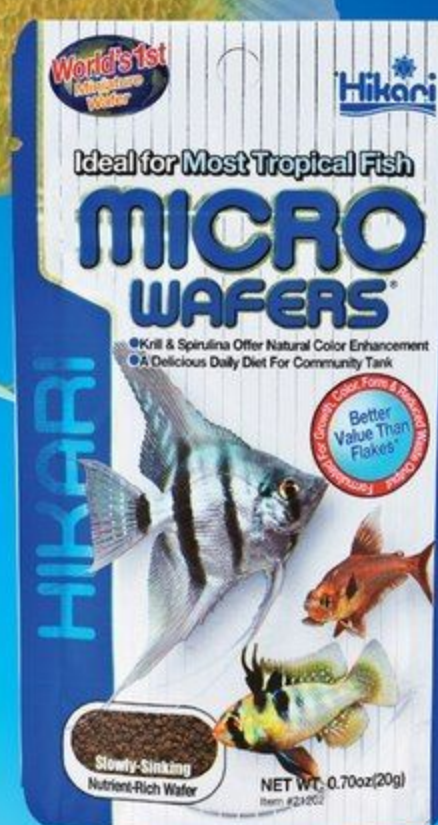
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This group of subadult angels belongs to the same brood. If you look closely, you'll see quite a variety of colors and patterns. In this group, silver was more prevalent than any other phenotype.

type silver angel? The marble trait is dominant to silver. Work out a Punnett square using "M" for the dominant marble trait and "m" for the recessive silver. This is another homozygous/homozygous cross with a dominant trait, so you will get 100% mixed genotypes and 100% marbles.

The same goes for crosses of zebra (dominant) and silver, black (dominant) and silver, and silver (dominate in this case) and gold (recessive to everything!).

Let's follow the young from the marble/silver cross by breeding brother to sister. Here we are breeding two heterozygous adults. The results from all such crosses follow the same pattern.

Homozygous/Heterozygous Crosses

- Crosses between individuals having only homozygous dominant genes will produce 100% homozygous offspring showing the dominant trait.

	1 M	2 m
3 M	4 MM	5 Mm
6 m	7 Mm	8 mm

A homozygous/homozygous cross (Silver Marble X Silver Marble) with a dominant trait resulting in 100% mixed genotypes and 100% marbles.

- A homozygous recessive individual crossed with homozygous recessive produces 100% homozygous recessive offspring.
- A homozygous dominant crossed with a homozygous recessive will produce 100% heterozygous young showing the dominant trait.
- A heterozygote crossed with a heterozygote always gives a 3:1 ratio of dominant to recessive young: 25% of the young are homozygous dominants, 50% are

heterozygotes that show the dominant trait, and 25% that show the recessive feature.

- A homozygote dominant crossed with a heterozygote yields 100% dominant traits: 50% homozygous dominant young, 50% heterozygous young.
- A homozygous recessive parent crossed with a heterozygote must produce a mix: 50% homozygotes carrying the recessive gene, 50% heterozygotes.

Consequently, there are efficient ways to make your crosses. If you want the young to be genetically uniform for a particular trait, then use the crosses that give you uniformity. These batches will require no sorting, saving a great deal of time.

If you need to produce a variety of young from one cross, use parents carrying to a mix of alleles. 🐟

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A black ghost knifefish is shown swimming in an aquarium. The fish is dark, almost black, with a long, thin body and a prominent dorsal fin. It is surrounded by green plants and a large, clear, leaf-like structure. The title text is overlaid on the right side of the image.

Adding Color to the Freshwater Aquarium: Accenting with Black

Phil Purser

■ Black ghost knifefish (*Apteronotus albifrons*).

Tony Terceira

Black fish are not exactly what I'd call vibrant, but they are regal and definitely add a very striking aesthetic element to the freshwater aquarium. They are stunning in the totality of their darkness and are mysterious in their pigmentation. In nearly any tank with virtually any inhabitants, black fish will almost certainly be eye-catching additions to the community. Most hobbyists agree that having stark splashes of black in a tank of otherwise brightly colored fish is aesthetically pleasing. The dark fish accentuate the bright colors of their tankmates, whose vibrancy makes the black inhabitants all the more distinct.

Black Mollies

Let's first look at one of the most crowd pleasing of all the black fish species: the black molly. The black molly is a short-finned cultivar of the sail-fin molly. Growing to lengths of no more than 2½ to 3 inches at full maturity, the black molly sports rich, black coloration throughout its scales, the rays of its fins, and even the eyes. Thus, this species makes a startlingly striking addition to the community tank.

The black molly is a very peaceful species that thrives best when supplied with heavy vegetative cover. It is not an especially powerful or fast swimmer, however, so it does best in tanks with bio-wheel style

or air-driven filters. Tanks fitted with powerheads may produce more current than fish of the genus *Poecilia* are comfortable swimming against. But black mollies, like most poeciliids, produce copious amounts of waste, so optimum filtration is necessary. Powerheads pointed toward the walls of the tank (to reduce direct current into the main volume of the tank) may be a good idea.

Like all molly species, the black molly is an obligate omnivore whose fare includes vegetable matter and soft-bodied invertebrates. Therefore, a tank supplied with live plants is preferable to a tank with exclusively plastic plants, as a hungry molly will help nibble down the dying and dead

ends of live plants. I personally recommend *Anubias*, *Sagittaria*, or *anacharis*. Many hobbyists also report good success with Java fern.

The black molly can be fed flake foods augmented with tubifex worms, bloodworms, and brine shrimp. Most hobbyists also recommend keeping mollies in tanks with high levels of algae, as mollies like to graze throughout the day between scheduled feedings. Even though they prefer meaty fare, these fish will take some vegetable matter.

While the black molly may appear to be a wonderful and easy (and inexpensive—most pet stores charge less than \$2.50 each for these fish) addition to the community tank, there are a few major problems. First, a molly requires somewhat different water chemistry than many other species. Aquarium salt, for example, which may be beneficial for many species, is usually considered necessary to the long-term survival of the black molly. Treat your tank with approximately $\frac{3}{4}$ to 1 tablespoon of aquarium salt per 5 gallons of water in order to properly maintain these fish. So salt-tolerant are the black mollies that they may even thrive, after a suitable period of acclimation, in a marine aquarium. Thus, a brackish environment is also an option for these fish.

Another downside to beware of is this species' propensity toward fungal infections. The ebony, velvety scales that make this species such a wonderful black addition to the home aquarium are highly sensitive to fungal and bacterial infections, such as *columnaris*. Regular water changes are absolutely essential (remembering to add aquarium salt after water changes or gravel vacuuming) to the long-term maintenance of this species. Mollies are also best introduced into established aquariums with proper water conditions. Despite their low cost, these fish are not the beginner species they are frequently sold as.

Black mollies thrive in water with a pH of 7.0 to 7.8, kH of 10 to 25, and water temperatures of 71° to 80°F. It is also important to house these fish with similarly slow-moving and peaceful species. Black mollies tend to fare better in tanks housing other poeciliid species, such as guppies, platies, swordtails, etc. Fast-moving or semi-aggressive species tend to bully or stress the black molly (which can lead to bacterial and fungal infection).



Tony Terceira

■ Black mollies require hard, alkaline, pristine water to thrive.



Andrzej Zabawski

■ With their puffy eyes, elaborate finnage, and slow movements, black moors do best in dedicated setups.

Black Moor

A second option for adding black to the freshwater aquarium is another slow-moving (yet much less delicate) species, the black moor. While some hobbyists will immediately reject the idea of mixing a black moor—a goldfish cultivar—with tropical fish, this species is certainly a freshwater aquarium favorite, and has been for decades. So long as a few water quality and temperature conditions are met, the black moor can make a long-lived and attractive addition to your tank.

The black moor is a type of goldfish with metallic black scales. The flanks and dorsum of this fish may, in fact, bear a slight bronze sheen. Old adults will be less black and

may be bronze or coppery in coloration. Thus, if a truly black moor is desired, pick the absolute darkest specimen you can find among your pet shop's livestock.

Growing to a maximum adult length of over 8 inches, black moors are suited for 30-gallon and larger aquariums as well as outdoor ponds. Black moors thrive in water with a slightly acidic pH, a range of 6.5 to 7.0 being preferable (though specimens may be acclimated to a pH as high as 7.5). Keep water temperatures in the upper 60s to low 70s. Black moors are best fed goldfish food instead of tropical flakes for long-term nutritional balance. Like the black molly, the black moor also thrives in tanks planted with living flora—*anacharis*,



Tony Terceira

■ Black ghost knifefish are usually out of sight under tubular cover, but clear tubing can be used to increase their visibility.

Bacopa, or *Cabomba* work well for this species.

When it comes to tankmates, the black moor is a little more problematic. Obviously, considerations of temperature and water chemistry will prevent this species from being mixed into every community tank. The temperament of the black moor's tankmates is also a major concern. Black moors have huge, bulbous eyes, elaborate and delicate finnage (the gaudy caudal fin is referred to by aquaculturists as a variety of veil tail), and their lack of pectoral and caudal strength leave them to either gracefully glide through the water very slowly, or, if speed is needed, to waddle awkwardly back and forth.

The combination of elaborate finnage, clumsy locomotion, and puffy eyes make the black moor an all-but-irresistible target for bullying. Barbs are particularly drawn to bully this species, as are gouramis and their kin. Even the normally fast-paced but docile tetras have a hard time resisting taking a nibble on the black moor's bulbous eyes or trailing tailfin. Thus, the black moor is a poor choice of tankmate in many home aquariums, but it is still a hardy choice for a dedicated setup.

Black Ghost Knifefish

My personal favorite black fish is one I fell in love with long ago: the black ghost knifefish. Native to the warm, languid waterways of northern and central South America, the black ghost knife (*Apteronotus albifrons*) is a truly unique and alien species. The body is compressed laterally, giving this fish a slightly eel-like appearance. The caudal fin is radically reduced; propulsion comes from undulations of the extremely elongate fin on the fish's ventral surface

and long, graceful swoops of the powerful pectoral fins.

Inky black in coloration except for a double ring of white around the caudal peduncle (some specimens have a thin, white stripe running the midline of the dorsum, though this is uncommon), these fish are scaleless and quite sensitive to both water chemistry and fungal/bacterial infections. But black ghost knifefish are gorgeous! Anyone who has ever sat, mesmerized by the graceful, fluid undulations of the elongate anal fin, can attest to this species' cryptic, almost otherworldly beauty. It is worth noting that the black ghost knife has a large head and jaws. Strapped with thick bands of muscle, these jaws are tell-tale signs of a predatory, carnivorous fish. Likewise, the caudal peduncle of this fish is very mildly electrogenic; the organ at the peduncle sends out an electric field that aids in the detection of prey (freshwater invertebrates, typically) in low-light or silt-heavy conditions.

Because the black ghost knife may grow to lengths of over 15 inches, it is certainly not for every keeper. Loaches, eels, severums, silver dollars, pacu, bichirs, and most equivalently sized South American cichlid species are a good choice of tankmate. Obviously, anything that could fit in the ghost knife's mouth is a bad choice, as these nocturnal predators tend to eat smaller tankmates. Invertebrate tank residents, such as crayfish, snails, etc., will *certainly* find themselves on the black ghost knife's menu.

If adding a black ghost knife to your aquarium, know that these fish absolutely love tubular cover. Caves, submerged hollow logs, and dense tangles of living plants are favorite haunts. In order to better see their ghost knife,

most hobbyists will drop a length of clear pipe into their tank. The pipe's structure allows the black ghost knife to feel secure and hidden from predators, while its transparency allows keepers to see their inky-skinned pet during daylight hours. Feed your black ghost knife meaty fare: brine shrimp, ghost shrimp, cut-up earthworms, bloodworms, etc. Because black ghost knifefish are susceptible to infection (fin rot is an all-too-common ailment), high water quality and superior filtration are absolute necessities. Maintain a pH of 6.5 to 7.0, a low water hardness, and temperatures of 73° to 80°.

Black Skirt Tetras

If smaller, non-predatory community fish are more to your liking, and you want to add some black to your aquarium, then may I suggest the black skirt tetra? The black skirt tetra (*Gymnocorymbus ternetzi*) is a South American species that thrives best when housed in schools of five or more members. A truly communal species that seldom pesters or nips at other community fish, the black skirt tetra is a wonderful addition to the tank of non-aggressive tropicals. While the face, eyes, and ventral surface of this fish may be silvery to gray in color, the dorsal, pectoral, and anal fins are black. Two dorsolateral bars of stark black slash across the silvery forebody, while the rest of the body darkens to black toward the caudal peduncle. A school of black skirt tetras makes a peaceful, darkly scintillating addition to the medium-sized or larger aquarium.

The pros of adding this black species to your tank are many, and the cons are few. A hardy and long-lived species, the black skirt tetra is best kept in slightly acidic aquaria. A pH of 6.5 to 6.8 is best, though gradual acclimation to neutral or higher pH is possible. This need for slightly acidic water may make the black skirt unsuitable for mixing in some community aquariums. Likewise, despite its benevolent disposition, the black skirt tetra may nip at tankmates with elaborate or excessive finnage—bettas, black moors, and fancy guppies may be bullied. Owing to this species' origin in subtropical waters, it also prefers slightly cooler water temperatures than most other tropical species. Temperatures ranging from 68° to 75° are preferable. Many hobbyists report success with the black skirt tetra in unheated tanks.

Freshwater Sharks

A final black species for consideration here is not a species, but a group of species

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Tony Terceira

■ The red-tailed shark has a penchant for being aggressive toward tankmates, especially in smaller setups.



Tony Terceira

■ Black skirt tetras are happiest in schools of five or more, and keeping them in groups should reduce their fin nipping of tankmates.

known as freshwater sharks. Several freshwater sharks are black-scaled beauties that can thrive in the community tank. The black shark (*Labeo chrysophekadion*) is the largest of the species I'll mention here, with wild specimens growing to lengths of over 20 inches. This is a heavy-bodied species that thrives on a combination of vegetable matter and meaty fare (many keepers feed

fresh green peas). Although a true bruiser in size, the black shark is typically a docile, slow-moving algae grazer, though it should not be mixed with very small species, as sleeping rasboras or danios, which can easily fit into this fish's mouth, may never be seen again in the morning. Tanks with high levels of algal growth are best for this species, as it tends to supplement its

scheduled feedings with long periods of grazing on aquatic vegetation.

The second member of the genus is the rainbow shark (*Epalzeorhynchos frenatus*). Sporting a long, black, torpedo-like body (from which this genus draws its common name of "shark," even though it is a member of the carp family), and reddish fins, the rainbow shark is perhaps the most popular freshwater shark. Selective breeding efforts have even produced albino specimens. The rainbow shark is very mild mannered if afforded plenty of territory to call its own. Most experts agree that these fish, which may grow to almost 8 inches in length, require large environs: 55 gallons or more is recommended.

The third and final member of the genus I will mention here is the red-tailed shark (*E. bicolor*). An avid chaser and nipper of slow-moving or elaborately finned species, the red-tailed shark can be very aggressive if kept in a tank that is too small. Thus, a red-tailed shark may nip, harass, or pester its tankmates.

Care conditions for virtually all members of this genus are the same: a pH of 6.5 to 7.0 and temperatures of 71° to 79° are recommended. Under weak or inefficient lighting, all three species may appear washed out or pale (charcoal) in coloration. Under full-spectrum lighting, however, their colors are at their very best: black as midnight, red as fire.

Additional Options

Of course, there are plenty of other black or blackish fish out there. The platies and guppies, for example, are two species that have been heavily experimented upon by selective breeding projects for the production of black and near-black specimens. Likewise, dark catfish or pleco species may be just what the doctor ordered for your personal tank. Though the blackness of these fish may not be as complete as that of the black mollies or the ghost knife, they may be better suited for life under the unique specifications of your own home aquarium. So keep a keen eye out for the darker fish in your local pet shop.

Whether opting for the community-friendly beneficence of the mollies or designer platies, or the graceful yet mildly predatory opulence of the ghost knife, or even the sleek, streamlined territoriality of the red-tailed shark, these inky wonders are certainly eye-catchers. The ebon beauty of black fishes can be just the thing you're looking for in terms of adding striking contrast or deep, midnight coloration to your freshwater aquarium. 🐟



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■ South American silver arowana
(*Osteoglossum bicirrhosum*).

THE SOUTH AMERICAN SILVER AROWANA

TOBIAS LIM KOON LI



Andrzej Zabawski

One of the most sought-after fish in the world is the Asian arowana (although it is illegal in many parts of the United States). It comes in a spectrum of colors: blue, red, violet, green, gold, and even a fusion of these colors. It is easy to see the appeal. In the Asian market, the red, gold, and, more recently, blue varieties are highly desired. This is largely due to the socio-cultural attachments to these colors, which are often associated with notions of prosperity, health, and luck.

Furthermore, arowanas share similarities in physical appearance to ancient dragons of mythology and legend. In Chinese folklore, dragons are known to be majestic, wise, and protective beings. In a similar context, an Asian arowana (particularly of the gold or red variety) is said to bring immense luck and prosperity to the entire family, particularly to the business aspect. In addition, when an arowana dies in a household for any reason, it is often seen as a noble sacrifice that takes away any bad luck or misfortune that would otherwise have befallen that family. Whether you believe it or not, it is a soothing idea that extinguishes the negative stigma associated with death. It allows owners to focus on the positive of their faithful pet's noble sacrifice. In a world defined by negativity, I choose to embrace any positivity I can muster, no matter how far-fetched or fanciful that belief may be.

A Popular Misconception

There are other types of arowanas out there, but they are not as popular as the Asian arowana. With an elongated body, lack of coloration, and lower price tag, many enthusiasts view the South American silver arowana as the common "ugly duckling" of the arowanas.

I am ashamed to admit that I used to be one of the many who did not see the appeal in keeping South American silver arowanas. I was engulfed in the hype and craze that surrounds red or golden Asian arowanas. These costly fish are beautiful to look at, and everybody wants them. What's not to love? I wanted nothing to do with silver arowanas as long as I had my Asian arowanas. In a childish and naïve manner, I led myself to believe that a silver arowana would somewhat tarnish my abundant collection of fish, as it can be seen as a mongrel—a pariah, even. But in just a few months, my whole outlook on arowanas and fishkeeping would be altered forever.



Tobias Lim Koon Li

■ Silver arowanas are the largest of all arowanas, reaching over 4 feet in length and needing a proportionately large enclosure.

In the midst of surfing YouTube for fish videos, I came across a video of a public aquarium in Beijing, China. I was blown away by the sheer magnificence and impact of the setup. In this giant glass tank were hundreds of fully grown silver arowanas patrolling the top of the aquarium. Never before in my fishkeeping experience have I witnessed such a majestic sight. The silver beasts extended their wings in unison and glided effortlessly through the exhibit. The video turned out to be even more amazing when the handlers threw food into the exhibit. In the blink of an eye, all the grace in the tank was replaced with feral hunger and panic as fish jumped over fish fighting for every scrap of food. It was an unbelievable experience watching such graceful animals attack their food so aggressively. At that moment I was hooked. I knew it would be an honor to keep such amazing animals, especially if I were given the opportunity to rescue some that had outgrown their tanks (a common occurrence for these fish). Just like that, all my prejudice disappeared. This marked the start of my wonderful journey into the world of the South American silver arowana.

Rescuing Big Momma

I will never forget my first silver arowana experience. It was late 2005 when my uncle came to me for fish advice. He was having trouble with his baby silver arowana

because she would continuously jump in her 4-foot tank. Unfortunately, this resulted in torn fins and broken scales. Furthermore, she lost her appetite and refused to swim, settling instead for sleeping at the bottom of the tank.

Although still a relatively inexperienced fishkeeper, I knew that these were all serious problems. All arowanas are famous for continuously swimming in any decently sized enclosure. Furthermore, they have voracious appetites that must be controlled by limiting their food intake. But it was the continuous jumping that immediately told me the tank was simply too small for this majestic beast.

Inadequate enclosures cause constant stress and fear in the fish, and this was probably the very reason she refused to eat. Silver arowanas are the largest of all arowanas, growing over 4 feet in length, so they require the largest enclosures compared to the other types of Asian and African arowanas. My uncle simply did not have the space or facilities to house his 2-foot arowana any longer. Immediately, I pounced on the opportunity to adopt his beautiful fish, which I named Big Momma.

Big Momma did not always live up to her name. When I first rescued her seven years ago, she resembled a skinny eel. She had barely eaten for months and was in bad shape. I immediately released her into my 4,000-gallon pond. She was so skinny that I had genuine fear my catfish would



Tobias Lim Koon Li

■ Human friendly, the author's silver arowana comes to the surface regularly to be petted and fed.



Tobias Lim Koon Li

■ Training arowanas to take prepared foods that rest at the surface will help curb their natural instincts to jump after insects.

try to eat her. Luckily, this fear never came to fruition.

With a new lease on life, Big Momma soared into her new home and never looked back. She was constantly on the move and was actively hunting after only 10 minutes of being released. I decided to throw in a few pellets, curious as to how she would react. In a ravenous rage, she pounced on the inanimate pellets like they had a life of their own. I was in shock and awe, as new fish in new surroundings usually do not eat for

days until they acclimate. I was convinced that Big Momma was thrilled to be in her new home and had readily accepted her new life. With a balanced diet of fish, shrimp, and pellets, Big Momma quickly put on a lot of size, transforming into one of the largest fish in my pond. Following Big Momma's successful rehabilitation, I continued to rescue more silver arowanas for my pond.

In Malaysia, I am currently housing four silver arowanas, one green arowana, and one Australian jardini. While all my fish

hold a special place in my heart, my silver arowanas definitely steal the show. They are the most graceful, the most aggressive feeders, and the most human friendly. They regularly stalk me in the hopes of a meaty snack while allowing me to pet them. They are also the largest and most physically imposing type of arowana, making them stand head and shoulders above the rest.

This contributes to the fact that Big Momma is one of my most famous fish, garnering thousands of views on my YouTube channel, "MyAquaticDiary." She is famous for being one of the largest silver arowanas in private captivity, measuring over 120 cm (50 inches) long with a girth to match. She is the tamest fish in the pond, allowing me to pet and hand feed her with ease. Considering my former reluctance to keep silver arowanas, it is poetic justice that one would win her way into the center of my heart.

Keeping Silver Arowanas

Big Momma's success story educated me vastly about how to grow a healthy and happy silver arowana. The most important factor is the size of the enclosure. Due to their immense size, large ponds are the best alternatives (other than the wild) to house one of these majestic animals. This theory developed when I first chose to grow out green, jardini, and other silver arowanas in a fish tank. Even in my 9-foot tank, the arowanas were marginally active and picky eaters. They were easily spooked and had the tendency to hurt themselves against the tank cover.

Eventually, I transferred all of my arowanas into my 13,000-gallon pond. Immediate differences were clear: The fish were a lot more active, ate voraciously, and were less skittish. In fact, I am proud to note that all my arowanas are human tame, able to be petted and hand fed. There is no doubt in my mind that these immediate results would have been impossible if not for the move to the fish pond.

Another crucial observation was the fact that my silver arowanas loved to swim against the current produced by the filtration pumps, much like a water treadmill. After researching this phenomenon, I discovered that the water flow created by the current pushes oxygenated water into their gills, allowing for more aerobic respiration. Furthermore, perpetual motion against the current allows the arowana to constantly exercise. This



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Tobias Lim Koon Li

■ Silver arowanas can live for over 50 years, so any potential arowana keeper has to be prepared to make a long-term commitment.

increases metabolism, improves digestion, and therefore encourages healthy muscle growth.

An important factor to note when keeping silver arowanas is their jumping tendencies. Like any arowana, silvers are notorious for jumping out of their tanks. In the Amazonian river basins, silver arowanas leap 4 feet out of the water's surface to catch their prey on overhanging leaves and branches. It is natural to assume that arowanas are born to jump.

Unfortunately, this amazing characteristic does not bode well for the average aquarist. At the slightest hint of food or fear, arowanas are known to leap out of aquariums, resulting in serious internal injuries or even death. It is of utmost importance to cover your arowana enclosures with weighted objects to prevent such accidents from occurring.

Based on my years of experience keeping these fish, the two main reasons arowanas jump are stress and food. A common cause of stress is when a fish outgrows its tank. In confined spaces, arowanas feel trapped. Their first instinct is to jump for freedom. In order to reduce the probability of this occurring, it is vital to provide ample space and surroundings for your pet silver arowana.

Silver arowanas are the largest of all the arowana species. Therefore, they tend

to require much larger enclosures than their Asian counterparts. In my experience, ponds make the best enclosures for silver arowanas to thrive because they replicate their natural surroundings. Another technique I have successfully employed is conditioning arowanas to eat food that will not attract a leap to the surface. In the wild, arowanas are known to leap mostly for insects and small lizards. By conditioning my arowanas to eat mostly pellets, fish meat, and prawns, they are not tempted by their usual prey.

Drop Eye and Silver Arowanas

A significant concern when keeping silver arowanas is a common condition called drop-eye. This condition occurs mostly in farm-bred silver arowanas found in fish shops and involves a layer of fat developing at the top of the eye, giving the eyes a drooping appearance.

There are three main theories on the cause of this common condition. The first blames rampant inbreeding of the species to meet the demands of the aquarium trade. Inbreeding often results in genetic deformities, one of which is allegedly the drop-eye condition. The second train of thought concerns the artificial diet we feed our arowanas, which has a high fat

content. This is mostly the case with live goldfish and frogs. Due to an increase in fat, arowanas then develop an extra pocket of fat around their eyes, resulting in the drop-eye condition. The third explanation is that arowanas in artificial glass tanks are unnaturally (since they are surface feeders) forced to look down constantly for food and at their reflection. This atypical mode of living has resulted in the deformity known as drop-eye.

While all three theories seem plausible, there is no concrete scientific evidence to suggest that any one is more correct than the other. Contrary to popular belief, an arowana can live a full and complete life even after it has contracted this condition. While there are surgical and therapeutic methods to fix this condition, the risks may far outweigh the potential solutions.

An Unsung Beauty

Overall, I feel blessed and lucky to have had the pleasure of keeping such an amazing species of fish. There is no substitute for the feeling I get after a successful hand feeding or brushing their armor-like scales against my palms. The level of human interaction these fish exhibit is equaled by no other fish (or species of arowana) that I have experienced. While proud parents aren't supposed to show preference toward their children, it is hard to hide my preference for these underrated beasts.

As noted above, silver arowanas are definitely not for every aquarist. They require a substantial enclosure for life coupled with many years of commitment (often over 50 years given the right conditions). But if you happen to be one of the few with the means of keeping this species of fish, an experience you will cherish for a lifetime awaits discovery. More often than not, you may also be able to rescue a fish that has outgrown its current home, adding to the richness of your potential silver arowana experience.

While it may be easy to recognize the beauty that everyone sees, we struggle to see the beauty that others don't. These fish singlehandedly taught me this important life lesson. It is my only hope that many of you will experience some of the amazing silver arowana memories forever etched in my thoughts. Much like the tale of the ugly duckling, my South American silver arowana truly grew up to be a magnificent swan. 🦢

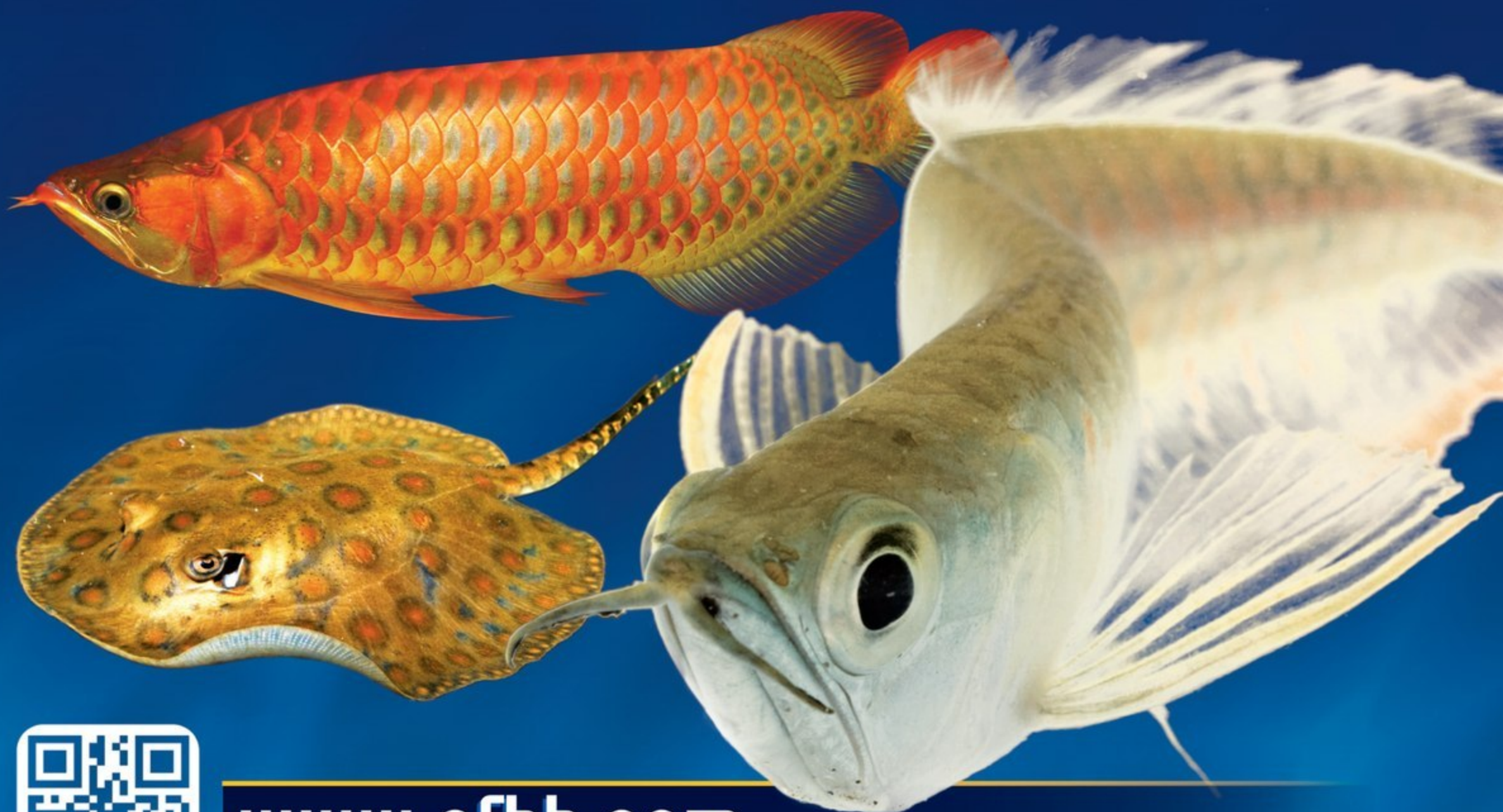


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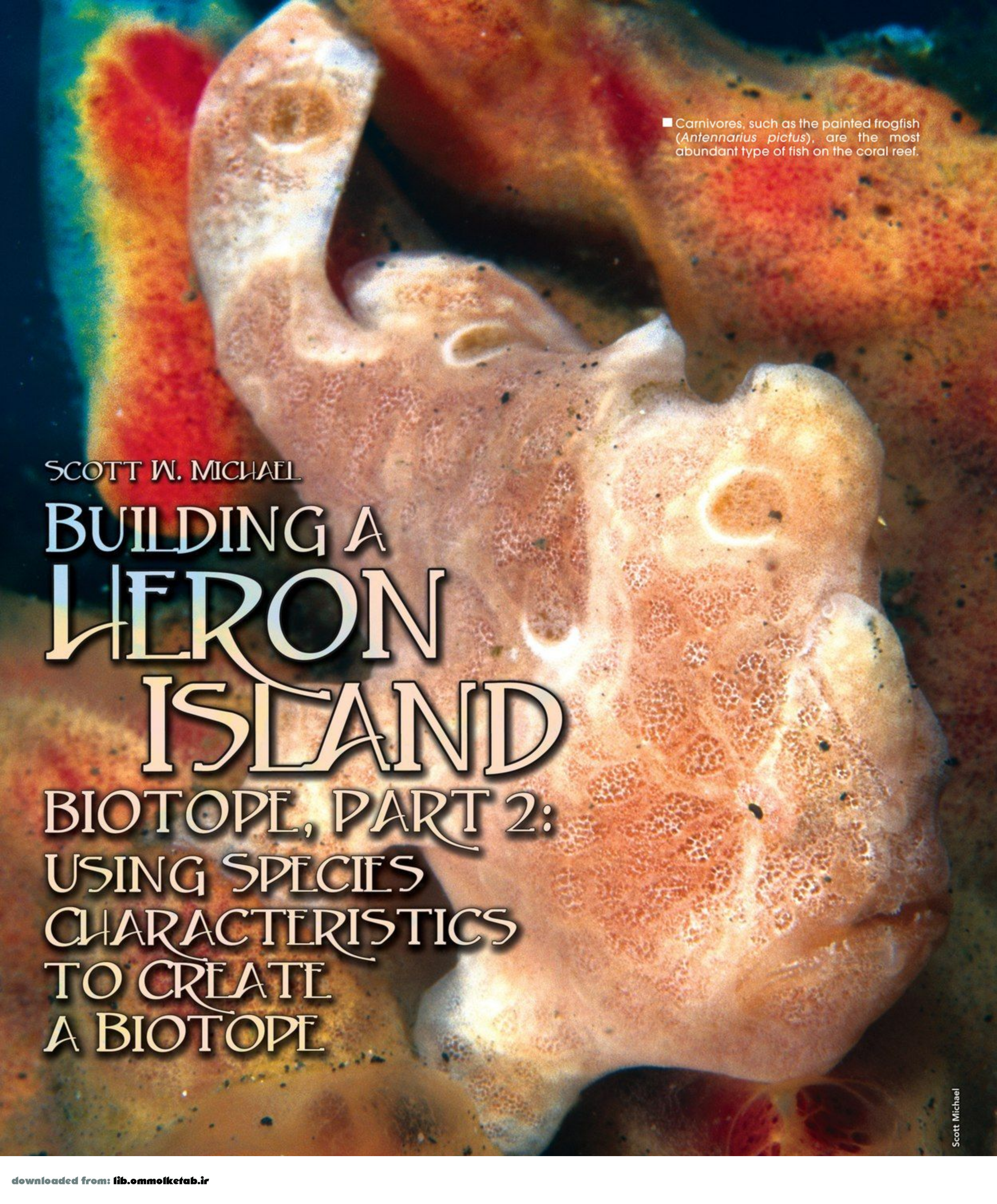
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A detailed photograph of a painted frogfish (Antennarius pictus) resting on a coral reef. The fish has a mottled orange and white pattern with prominent white spots and a large white patch on its head. It is positioned in the center-right of the frame, facing right. The background shows vibrant coral in shades of red, orange, and yellow, with some blue and green areas visible on the left.

■ Carnivores, such as the painted frogfish (*Antennarius pictus*), are the most abundant type of fish on the coral reef.

SCOTT W. MICHAEL

BUILDING A HERON ISLAND

BIOTOPE, PART 2:
USING SPECIES
CHARACTERISTICS
TO CREATE
A BIOTOPE

Reef fishes have evolved to survive in the complex, species-rich coral reef ecosystem. This includes the development of many behaviors that help them acquire nutrients, defend resources, and find mates. They not only interact with their own kind, but also the many species with which they share their coralline neighborhood. When a fish is collected off the reef and ends up in your aquarium, it brings with it this behavioral repertoire that has facilitated its survival in nature. This can be both good and bad. Some of these behaviors can present the aquarist with husbandry challenges. Others can be fascinating to observe and may even benefit the captive community.

In this article, I will continue our examination of the behavior and ecology of coral reef fishes and how to apply this information in the creation of a captive fish community. In the first installment, we looked at the various reef zones and decided to set up a fish community representing a reef slope from Heron Island, southern Great Barrier Reef (GBR) (see table for our species list). Let's begin this second installment by briefly surveying what coral reef fishes eat and how that impacts the species on our list.

Food Habits

It is vital to know something about the natural diet of the species we intend to keep so we can provide an adequate captive diet and



■ Laboute's fairy wrasse (*Cirrhilabrus laboutei*) is beautiful, but avoid keeping multiple males, for that would lead to inevitable fighting.

prevent problems with tankmates. Obviously, we don't want to place a fish that will eat its neighbors in an aquarium, but there are also species that will attack food competitors. Take the damselfishes—those species that defend an algal resource in nature will drive off any other fish with a similar diet. If you place one of these damsels in your aquarium and then add natural food competitors, prepare to watch the scales fly! There is one thing

to remember when using dietary information to determine fish-invertebrate compatibility: Fish don't read scientific journal articles and sometimes eat things these papers say they won't! For example, there are herbivores that will occasionally pick at coral tissue (possibly to get at the symbiotic algae that live in the coral's tissues). That said, fish usually conform pretty closely to their natural dietary proclivities when moved from the reef into an aquarium.

Let's examine the main coral reef fish feeding guilds: the detritivores, the herbivores, and the carnivores. A group we will not be covering in depth is the omnivores—those species that eat both plant and animal matter.

POOP EATERS

Detritivores feed on decaying organic matter, coral slime, and fish feces (yes, poop!). The detritivores we most often encounter in the aquarium trade are the damselfishes, blennies, and surgeonfishes. Many damselfishes actually farm algae in which detritus collects. They then harvest the detritus from the algal mat. These damsels tend to be highly territorial and will attack any fish that may alter their detritus collection device (the algae), as well as other detritus eaters. There are blennies that engage in similar behavior to these damsels.

The surgeonfishes tend to be more mobile detritivores—these would include certain *Acanthurus* spp. (e.g., the orangeshoulder surgeonfish [*A. olivaceus*]) and many bristletooths (*Ctenochaetus* spp.). They suck

Species	Number of Individuals
Lyretail anthias (<i>Pseudanthias squamipinnis</i>)	1 male; 5 females
Oblique-lined dottyback (<i>Cypho purpurascens</i>)	1 male
Stark's demoiselle (<i>Chrysiptera starcki</i>)	1
Watanabe's angelfish (<i>Genicanthus watanabei</i>)	1 male; 1 female
Herald's angelfish (<i>Centropyge heraldi</i>)	1 male; 1 female
Chocolate surgeonfish (<i>Acanthurus pyroferus</i>)	1
Laboute's fairy wrasse (<i>Cirrhilabrus laboutei</i>)	1 male; 1 female
Blackear wrasse (<i>Halichoeres melasmopomus</i>)	1
Midas blenny (<i>Ecsenius midas</i>)	1
Yellow shrimp goby (<i>Cryptocentrus cinctus</i>)	1 male; 1 female

■ Proposed list of species for 180-gallon Heron Island reef slope aquarium.



■ Lyretail anthias (*Pseudanthias squamipinnis*) should also be kept in female-dominated groups to mitigate the aggressive tendency of males.

diatoms and detritus off sand substrates or comb detritus off hard substrates. Some surgeonfishes also like to eat fish feces. They will form shoals under schools of zooplankton or carnivorous fishes and ingest the poop that rains down. In the aquarium, the territorial detritivores can be hellions, while those that are more home ranging are not particularly problematic. Their diets should include plant material as well as a varied food for carnivores. They will also ingest some of the detritus that forms in the aquarium, which is a beneficial service.

ALGAE EATERS

Reef fish herbivores feed mainly on algae, although some also eat sea grass. The primary

reef herbivores are the damsels, parrotfishes, blennies, rabbitfishes, and surgeonfishes. Algae-eating damsels tend to be highly territorial, as do some surgeonfish species (e.g., the powderblue surgeonfish [*Acanthurus leucosternon*]) and certain blennies (e.g., the redlipped blenny [*Ophioblennius atlanticus*]). These species bring their pugnacious attitudes with them into the aquarium and can wreak havoc in a captive community, especially if housed with other herbivores. They need plant matter in their diets if they are going to thrive. This can be in the form of algae-infused foods, freeze-dried algae sheets, and the algae that naturally grows in the aquarium. Careful selection of algae-eating fishes (and invertebrates) for your aquarium will also



■ The Midas blenny (*Ecsenius midas*) pairs well with lyretail anthias, going so far as joining them in the water column and mimicking their movements.

help keep botanical pests from overgrowing your captive reef in the same way they do in nature.

ANIMAL EATERS

When it comes to the number of species, the carnivores are the most abundant on the coral reef. There are a number of different subcategories within this guild. There are species that feed mainly on relatively large motile invertebrates and other fishes, like the moray eels, frogfishes, scorpionfishes, groupers, comets, snappers, some wrasses, sand perches, and porcupinefishes. Many of these fish feed less frequently (e.g., some eat as few as one prey item every day or two). They are not to be trusted with any crustacean or fish small enough to fit in their maws! However, they are not a threat to sessile invertebrates, like stony and soft corals.

There are also those carnivores that feed on smaller, mobile prey. This group includes the pipefishes, seahorses, many dottybacks, lots of wrasses, dragonets, and many gobies. Most of these fishes are easy to keep in the home aquarium, but there are some that may be reluctant to take anything but live foods (e.g., pipefishes, leopard wrasses, dragonets). These species are best placed in a tank with a healthy population of microcrustaceans (e.g., “pods”—copepods, amphipods). They are also more prone to suffering if they are housed with more aggressive food competitors.

Micro-invertebrate eaters specialize in zooplankton. These include the garden eels, anthias, grammas, fusiliers, torpedo tilefishes (*Hoplolatilus* spp.), lyretail angelfishes (genus *Genicanthus*), certain damselfishes, some gobies, and dartfishes. These fishes feed throughout the daylight hours, ingesting hundreds of prey items in a day's time (there are also some nocturnal species that eat zooplankton, including soldierfishes and certain cardinalfishes). They do best when fed several times (or more) every day.

Finally, there are those carnivores that feed mainly on sessile invertebrates, like the butterflyfishes, angelfishes, a handful of wrasses, trunkfishes, filefishes, and puffers. Some members of this group (e.g., those that eat only coral) do not thrive in the aquarium, apparently suffering from nutrient deficiencies, and many are a potential threat to corals. That said, beware that their dietary preferences may be so specific that certain corals may be ignored, while others are devoured.

Considering Heron Island Species List

It turns out that the most well represented feeding guild in our Heron Island species list are the zooplanktivores. The lyretail anthias,

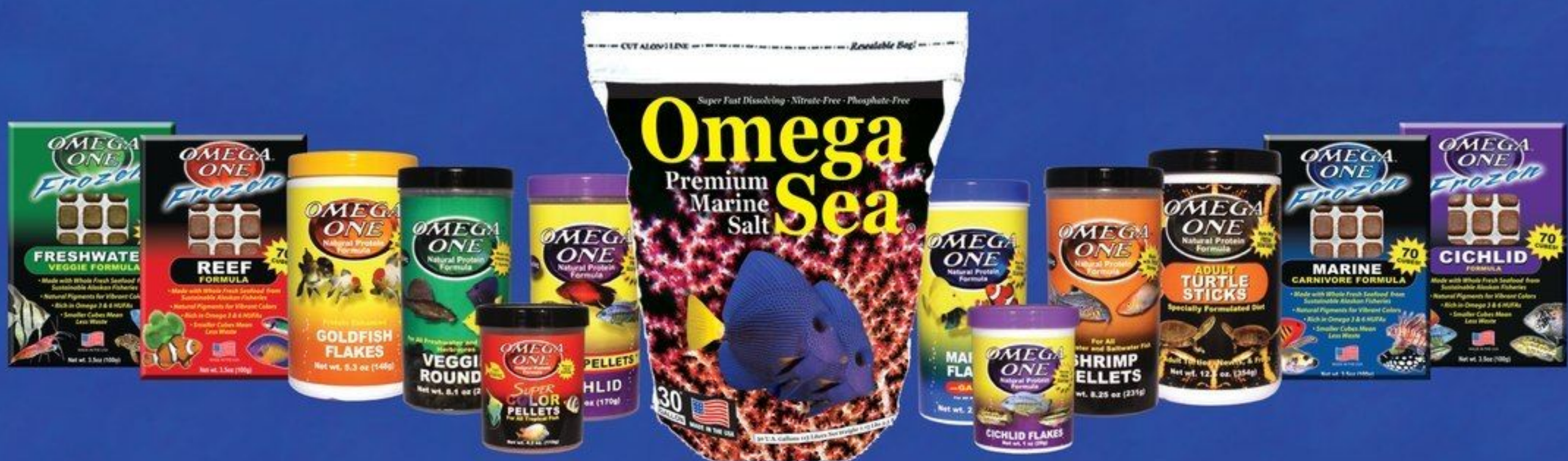


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Scott Michael

■ The oblique-lined dottyback (*Cypho purpurascens*) exhibits bi-directional sex change; both males and females are capable of changing sex.

Starck's demoiselle, Watanabe's angelfish, Laboute's fairy wrasse, and the Midas blenny are all zooplankton feeders. Herald's angelfish feeds mainly on detritus and diatoms, while the blackear wrasse and the yellow shrimp goby feed on smaller, motile invertebrates.

While we have a lot of dietary overlap with the zooplankton feeders, these species are rarely food aggressive. The only possible exception is Starck's demoiselle, which sometimes chases other zooplankton feeders.

The blackear wrasse and shrimp goby do not defend a food resource, so this should not be an issue. Herald's angelfish may chase other detritus eaters, but there are no others in the tank, except possibly the chocolate surgeonfish. The latter species is an herbivore/detritivore that does not appear to defend a food resource (captive observations suggest it is relatively peaceable). Looks like trophic overlap and associated aggression problems should be minimal.

The majority of the species here should not bother the corals and other motile invertebrates we hope to keep. The only possible exception would be Herald's angelfish, which has been known to nip at the flesh of large-polyped stony corals on occasion. But this tends to be less of a problem if the fish is well fed. Also, smaller ornamental shrimp (like anemone shrimps in the genus *Periclimenes*) may be eaten by the blackear wrasse or even a larger yellow shrimp goby. You will want to put the cleaner shrimp in the tank before the wrasse.

Sexuality and Social Behavior

The sexuality of a marine fish species will determine how easy it will be to acquire a male and female for your aquarium and can

also impact how the sexes interact with one another. Reef fishes can be placed in one of two groups—gonochorists or hermaphrodites. The sex of members of the first group is determined early on in development and is fixed. There are known gonochorists in the scorpionfish, butterflyfish, goby, triggerfish, filefish, and trunkfish families, but not all members of these groups may conform to this sexual pattern.

In the second group, the sex of an individual can change based on size, age, or social status. Most reef fish families exhibit hermaphroditism, with this group exhibiting a variety of subcategories. There are simultaneous hermaphrodites, which have the functional sex organs of both a male and female (e.g., hamlets [*Hypoplectrus* spp.]), and synchronous hermaphrodites, which have a single set of working sex organs at any one time (many reef fishes fall in this subcategory). The synchronous hermaphrodites can be either protogynous (change sex from female to male), protandric (change sex from male to female), or exhibit bi-directional sex change. In the latter case, individuals can change sex either way based on the social setting (e.g., if there are too many males, a male may change back to a female).

The social structure and behavior of a species is dependent in part on sexual and feeding behavior. For example, some protogynous species are territorial, with a dominant male occupying a territory that includes several females. Likewise, many algae eaters are territorial because this plant material is in short supply and a patch of it can be defended. For the sake of our survey, we will break the social behavior of fishes into the following categories: territorial, home ranging, and group forming.

The territorial species are those that defend a particular area of the reef. In some cases, as discussed above, they exclude only members of

their own kind (e.g., groupers), while in other species they chase off any food competitors (e.g., certain damsels). The home-ranging species roam over the reef looking for food. Their food source is often less localized or clumped and thus more difficult to defend. While they do not defend a specific area, they may chase off conspecifics if they should encounter each other (e.g., zebra lionfish [*Dendrochirus zebra*]).

Group-forming species live in schools or shoals or regularly aggregate. These fishes often rely on safety in numbers—they tend to be smaller (but not always) and may feed high in the water column where they are more susceptible to predators. There are other group-forming species that aggregate around a favorable hiding place or food source.

Reconsidering Heron Island Species List

Now that we have more insight into reef fish sexuality and social behavior, let's revisit our Heron Island biotope tank. Let's start with the lyretail anthias. This is a protogynous hermaphrodite that occurs in groups that consist mainly of females. The males in these groups spend much of their time chasing other males away from their harem of females, as well as dominating their herd. Males suppress sex change by exerting their dominance, which is an important thing to know when housing a group of anthias. If you do not keep enough females, the male will often harry a solitary or pair of females to death. By putting enough individuals in an aquarium, aggressive interactions are dispersed enough that no one fish is picked on incessantly. Our five females and single male should be good for our Heron Island biotope.

The oblique-lined dottyback exhibits a bi-directional sex change. While information on its behavior in nature is lacking, it is non-selective about who it accosts in the aquarium. In fact, most of the dottybacks can be tyrants in aquarium confines. For this reason, I have decided to omit it from my Heron Island tank. Stark's demoiselle is a solitary species that is probably a protogynous hermaphrodite (others in the genus are, anyway). As mentioned above, it can be a bit bellicose, but it is not as aggressive as some of the algae-defending damsels. I am going to give this species a try but will watch it carefully and remove it from the tank if it begins picking on the anthias.

Watanabe's angelfish is a protogynous hermaphrodite, with the male and female exhibiting bold color differences. This fish forms heterosexual groups (with more

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■ Foxface rabbitfish (*Siganus vulpinus*); rabbitfishes represent one of the primary groups of reef herbivores.

females than males). Males form dominance hierarchies, with the largest male being at the top of the pecking order. The dominant fish will chase subordinates to maintain its position. For this reason, you should keep only one male per tank. Females, on the other hand, are rarely aggressive toward one another. I think my original group of one male and a female will work well, though we may be able to squeeze in a second female. While the presence of a male will usually inhibit females from changing sex, they will occasionally do so in captivity. If this happens, one of the males will need to be removed.

Herald's angelfish is a protogynous species as well, but it exhibits a harem social structure. A male will have a territory that is occupied by one to four females. Once again, there are color

differences between males and females, though more subtle (males tend to have dusky areas on the face). We need to make sure we add two disparately sized individuals simultaneously, one preferably with a darker face—this will help ensure we get a male and female and that an all-out battle is less likely to occur.

The chocolate surgeonfish is not a well-studied fish. It tends to be solitary and apparently feeds on microalgae and some detritus. It does not appear to be highly territorial, though it may behave aggressively toward its own kind. In the aquarium, it tends to be rather placid and should fit in well with our Heron Island community. An interesting sidebar on this species is that the juveniles are near-perfect chromatic replicas of the halfblack angelfish (*Centropyge vroliki*). Predators

may avoid the angelfish because it has a prominent cheek spine. In turn, predators might also avoid the more vulnerable juvenile *Acanthurus pyroferus*.

How about our wrasse selections? Laboute's fairy wrasse forms shoals and is a bi-directional sex changer. While they form groups, males do not like each other and are likely to wage mortal combat in aquarium confines. For this reason, we need to keep one male and one or more females (similar to *G. watanabei*). Data on the social behavior of the blackear wrasse is not available, but others in the genus are harem, with the male defending a roaming group of females. They are also thought to be protogynous hermaphrodites. Keeping one male is our best bet. We could add a female, but they rarely show up in the aquarium trade because they are not as pleasingly marked.

The Midas blenny is a solitary fish that tends to swim into the water column where it often joins groups of lyretail anthias. In fact, some ethologists suggest that these blennies actually mimic the anthias, deriving protection from swimming among this group of potential piscivore targets! These fish are thought to be gonochorists. It should fare well in our proposed Heron Island fish community.

Finally, the yellow shrimp goby is usually found singly or in pairs in the burrow of an alpheid shrimp. The shrimp does the housework, keeping the burrow clean of debris and mending the walls if a section should collapse. The fish reciprocates by providing watch. It sits at the entrance of the burrow and lets the shrimp know if danger threatens (it does this by wagging its tail). If we keep a shrimp goby, we will need to acquire its shrimp associate—not because the goby will not live without it in the aquarium, but because it is so amazing to watch! These gobies may be slightly dimorphic, with males tending to be a bit larger than females (though not always). So, to increase our chances of getting a pair, it is a good idea to get individuals that differ in size. The gobies vary in their sexual allocation, with all forms of sexuality being displayed. There is some evidence that suggests the *Cryptocentrus* are gonochorists, but the verdict is still out.

That ends our look at the behavioral and ecological elements that should be considered when setting up a captive reef fish community. This information on their natural history will not only help us better understand the animals we keep, but also facilitate the selection of species that will get along and interact in interesting ways. Happy fish watching! 🐠



■ The margined coralfish (*Chelmon marginalis*) feeds on sessile invertebrates.

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■ One of the Long Island Aquarium's many highlights is a 20,000-gallon live coral reef tank.

Mark Denaro

A Visit to the Long Island Aquarium

Mark Denaro

I recently had the opportunity to speak at a meeting of the Long Island Aquarium Society. Their meetings are held at the State University of New York at Stony Brook, which is fairly close to the eastern tip of Long Island. I've been wanting to visit the Long Island Aquarium for the last few years but hadn't had the time to make the drive to Riverhead, New York on the eastern end of Long Island, so this was a great chance to combine the two activities and make a full day of it. Formerly known as Atlantis Marine World, the Long Island Aquarium is definitely a destination that should be on your list of places to see. I enjoyed my visit so much that my local club, the Bucks County Aquarium Society, scheduled a group trip to the aquarium, where everyone enjoyed it as much as I did. The exhibits are far too numerous for me to mention all of them, so I'll just tell you a bit about the ones I found most interesting.

An Extensive Aquaculture Facility

Upon arrival at the aquarium, I was met by aquarist Todd Gardner, who took me on a behind-the-scenes tour. I've been lucky enough to go behind the scenes at a number of aquariums in the United States, and the Long Island Aquarium is by far the most impressive. Every bit of available space is being used for something, and the aquaculture program that Gardner runs is extensive.

The aquarium is propagating numerous species of fish, including a variety of clownfish that will hopefully soon include their new arrival, *Amphiprion chrysogaster*. They're also raising damsels, gobies, bamboo sharks, and several species of seahorses. Gardner has just succeeded at raising the world's first *Liopropoma* basslets in captivity. The aquarium has breeding pairs of both the candy basslet (*L. carmabi*) and the Swiss Guard or peppermint basslet

(*L. rubre*). Todd has been collecting the eggs of both species and had to wait until the young fish colored up to find out that the first ones he raised successfully were *L. rubre*.

The pelagic larval stage of these fish is extremely long lasting, 69 days (I was there on day 51) until the first fry settled to a bottom-oriented lifestyle. Complicating their rearing is a filament that extends from the dorsal fin and is many, many times the length of the body. This filament includes a number of fluid-filled bladders, and its function may be related to buoyancy, but determining that will require additional research. If the filaments become entangled, bad things happen, so it takes a lot of space to rear each larva. Todd has now raised *L. carmabi* and the extremely rare deepwater species, the bicolor basslet (*L. klayi*).

The aquarium also raises a number of marine invertebrates, including berghia nudibranchs, several species of

jellyfish, and a variety of shrimp, plus the flamboyant cuttlefish (*Metasepia pfefferi*), which the Long Island Aquarium has provided to numerous other aquariums and has now begun to supply in limited numbers to the pet trade. The largest invertebrate-propagation project involves the corals in the crown jewel of exhibits, the 20,000-gallon reef tank. The corals in this tank are clipped or fragged on a regular basis, and the frags are grown out in troughs with lots of light and water flow until they're large enough to be transplanted or traded to another institution.

Of particular interest to freshwater hobbyists, the aquarium is also raising motoro stingrays (*Potamotrygon motoro*).

Another interesting research program involves the chain catshark (*Scyliorhinus retifer*). This small species (for a shark) grows to a length of 2 feet and inhabits the continental shelf from Nova Scotia to Nicaragua, where it lives at depths of about 330 to 1,300 feet. It is a beautifully patterned species that would be a great addition to the hobby if only it could be kept at room temperature. Unfortunately for the home hobbyist, it requires very cold water.

The Long Island Aquarium maintains a colony of over 100 of these fish for research. They are examining a number of issues, including feeding behavior, and have shown that sharks are not the voracious feeders that many people think they are. They're also looking at a variety of issues relating to food assimilation and growth and how that is affected by sex, age, and water temperature. Other aspects of this research involve reproduction and hormone levels and determining if all the eggs laid by a female are fertilized by a single male or if they are fertilized by multiple males. If they are fertilized by multiple males, is the fertilization random, or is there some factor that allows the sperm of one male to outcompete those of others to fertilize a disproportionate number of eggs? It's very fascinating stuff and will significantly increase our knowledge of shark biology.

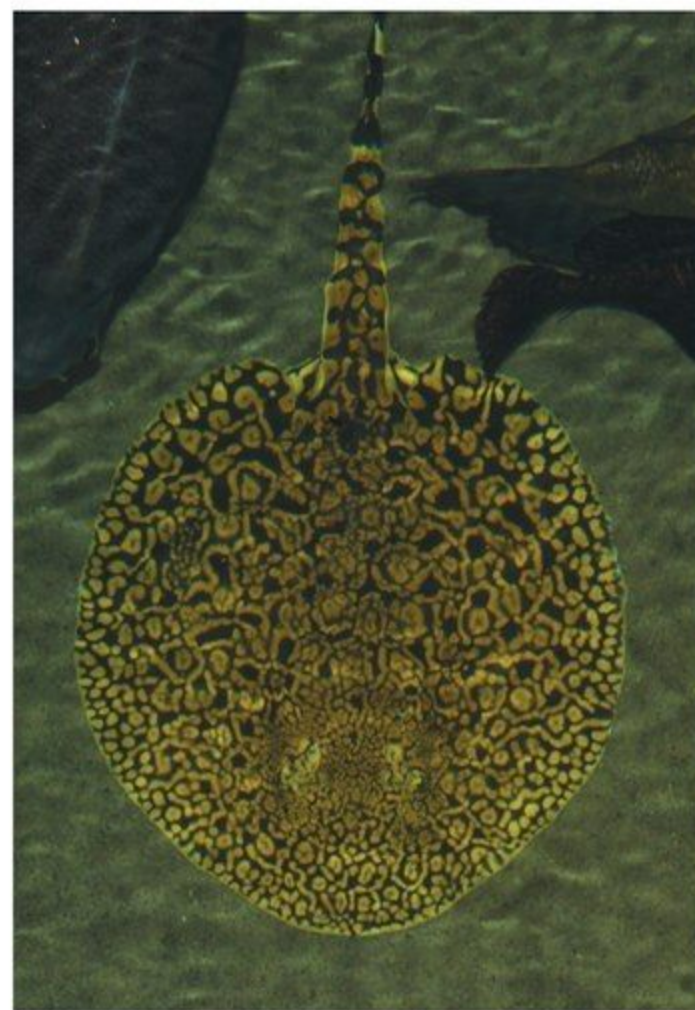
Coral Reef Tank and Surrounding Exhibits

After my behind-the-scenes tour, I spent the rest of the day exploring the exhibits from the public side. The 20,000-gallon reef is the most impressive display I've ever seen at any aquarium. It boasts an incredible array of corals, including both



Mark Denaro

■ Candy basslet (*Liopropoma carmabi*); the aquarium is renowned as being the first to breed *Liopropoma* basslets in captivity.



Mark Denaro

■ Freshwater stingrays are among the many animals being bred at the aquarium's aquaculture facility.



Mark Denaro

■ Featuring a wide variety of fish ranging from tiny damselfish to the Napoleon wrasse, the 20,000-gallon reef tank is a hotspot for viewing the diversity of the reef.

hard and soft corals and gorgonians. Many of the corals are several feet in height or diameter, and they're built up in a way that really mimics a natural reef. In fact, the only thing that makes the observer realize they're not looking at a slice of nature is the combination of animals from different oceans and seas.

The fish range in size from a couple of inches up to a few feet long in the case of the Napoleon wrasse (*Cheilinus undulatus*),

which is still growing. The population is extremely diverse and includes a number of flag basslets, numerous angels, damselfish, clownfish, gobies, butterflies, wrasses, an unbelievable variety of tangs, and others. The fish are from the Atlantic, Pacific, and Indian Oceans, plus the Caribbean and Red Seas. This display was like a magnet for me and kept drawing me back, and I probably spent several hours watching it throughout the day.



■ Moorish idols (*Zanclus cornutus*) are kept in an anemone-filled display.



■ The 2,000-gallon Malawi tank features an abundance of cichlids from the African Great Lake.

There is a row of 2,000-gallon aquariums across the main hall from the reef display. As one approaches them, the anemone and clownfish display really grabs the eye. It is brightly lit and filled with anemones along with lots of clownfish of a variety of species. Other fish include a group of Pacific blue tangs (*Paracanthurus hepatus*), two spectacular Moorish idols (*Zanclus*

cornutus), a pair of saddleback butterflies (*Chaetodon falcula*), plus a few other tangs. The next tank in the row is only dimly lit and replicates a shipwreck turned artificial reef, housing predatory fish such as groupers, lionfish, frogfish, and squirrelfish. To its left is a Lake Malawi biotope that houses mbunas and haps. The final display in this section is a local rocky-shore biotope that



■ The aquarium has raised and supplied flamboyant cuttlefish (*Metasepia pfefferi*) to other aquariums and the pet trade.

features growing kelp and other plants. Other aquariums in the main hall house seahorses and cuttlefish, all of which have been bred at the Long Island Aquarium.

Many of the Atlantic species on exhibit were collected around Long Island by Gardner and other staff members. These include species that live around Long Island year round and those that live in the tropical West Atlantic and whose eggs or larvae are carried north on the Gulf Stream. The tropical species cannot survive the winter in northern latitudes, so all the fish they collect have been saved from death due to cold temperatures.

Locally collected tropicals on display include blue angels (*Holacanthus isabelita*), several butterflies (*Chaetodon capistratus*, *C. sedentarius*, and *C. striatus*), blue tangs (*Acanthurus coeruleus*), doctorfish (*A. chirurgus*), various squirrelfish, the invasive lionfish (*Pterois miles*), and others. Year-round natives living at the aquarium include sand tiger sharks (*Carcharias taurus*) displayed in the Lost City of Atlantis Shark exhibit, Atlantic silversides (*Menidia menidia*) and Atlantic menhaden (*Brevoortia tyrannus*) in the Schooling Fish exhibit, flounders (*Pleuronectes americanus*) in the Flounder Find, and numerous other species.

Poseidon's Treasure Room

An interesting area located upstairs is Poseidon's Treasure Room, which features a number of smaller tanks of a similar size to those most of us have at home. A few that are of particular note include a tank of bamboo shark eggs, which are lit from behind so

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■ The 80,000-gallon snorkel tank is a favorite place for kids to swim.



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■ The snorkel tank includes an assortment of species, such as inquisitive rays.

the observer can see the embryos moving inside the eggs; a very nicely planted tank housing Asian hillstream fish, including loaches along with rasboras, danios, and other cyprinids; and one of my favorite exhibits that is stocked with very colorful non-photosynthetic corals and other filter-feeding invertebrates along with a blue-striped dottyback (*Pseudochromis springeri*) and a juvenile banded butterfly (*Chaetodon striatus*) that was caught locally this year.

The Touch Tank

The Touch Tank is a treat for everyone, especially for the younger members of the family. There visitors can touch sea stars,

clams, whelks, hermit crabs, horseshoe crabs, and other invertebrates. At Ray Bay, visitors can touch southern stingrays (*Dasyatis americana*) and cownose rays (*Rhinoptera bonasus*), and even participate in scheduled feedings. Kids of all ages will be delighted by the Butterfly Exhibit, where visitors can get up close and personal with a number of different butterflies, including blue morphos (*Morpho menelaus*), often referred to as the bluest thing on earth. From the Butterfly Exhibit, visitors walk through the Lorikeet Exhibit, where they can interact with these colorful, social birds. Bird lovers should also be sure to take in the Amazon Rainforest, which

houses a number of parrots that are all rescued pets.

Outdoor Exhibits

Outdoor exhibits include river otters, penguins, seals, sea lions, and a water garden/koi pond. The Pirate Snorkel Adventure, an interactive experience in the 80,000-gallon snorkel tank, is a great opportunity to swim with the fishes and a particular favorite of kids, who should be good swimmers and bring a bathing suit. The interactive salt marsh allows visitors to see the typical brackish-water killifish habitat and get up close and personal with the spider crabs that inhabit this area. I highly recommend a cruise on the Atlantis Explorer Tour Boat, which cruises down the Peconic River and into Flanders Bay, with educators promoting environmental awareness and education about the Peconic estuary. The boat stops at a small island where visitors can see the habitats of fiddler crabs, snails, hermit crabs, and numerous other species. Some



Mark Denaro

■ The Atlantis Explorer Tour Boat makes a stop at a small island where kids can try seining for local wildlife.

of the younger kids will have a chance to run a seine around the island to catch various species of fish, shrimp, and other creatures. The learning continues on the boat as the educators discuss the fish that were caught, explain the life cycle of the local spider crabs, and play *Fear Factor* with lots of local invertebrates. Numerous other interactive experiences are available, and you can find more information and plan your visit at the aquarium's website, www.longislandaquarium.com.

I definitely plan to visit the Long Island Aquarium again. If I lived closer, I'd volunteer and would be there on a regular basis, but the drive makes that unfeasible so I'll have to settle for visiting. If you have the opportunity to visit, you should definitely take advantage of it. Maybe I'll see you there! 🐬



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Florida Aquarium Fish Expo • June 20-23 • Fort Myers, Florida

The Florida Aquarium Fish Expo is a bi-annual event that attracts aquarium enthusiasts from around the world and serves as a showcase for hobbyists as well as suppliers in the aquarium trade. Whether you keep a single betta bowl or a fishroom with hundreds of gallons of stocked tanks, there is something for everyone! For more information, visit www.flafishshow.com.

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American Killifish Association

The American Killifish Association (AKA) is dedicated to the propagation, study, and conservation of killifish. Enjoy the benefits as a member. Membership is \$26 per year and includes six issues of the Journal of the American Killifish Association and monthly issues of the Business Newsletter, which gives members the opportunity to obtain and sell killifish. Members are also given access to the members-only section of the website. The AKA hosts many events during the year, including the big Memorial Day Weekend convention and affiliate club shows, which occur all year long. Log on to www.aka.org for more information.

American Livebearer Association

The American Livebearer Association (ALA) offers bi-monthly publications, species maintenance programs, access to various types of livebearers, an annual convention, special publications, slides, and more. For more information, visit www.livebearers.org

The Angelfish Society

The Angelfish Society (TAS) is a collection of angelfish enthusiasts, hobbyists, and breeders who are interested in the advancement of our hobby through improvements in the quality of the fish we keep and breed by employing the standard which this society will develop. TAS is dedicated to the enhancement of the angelfish through high-quality breeding programs using standards established by the society. Informative online chatroom meeting schedules can be found at www.theangelfishsociety.org. Membership is \$5 annually, which includes the quarterly FinTASTic newsletter.

Aquatic Gardeners Association

Membership in the Aquatic Gardeners Association includes a full-color quarterly journal with informative articles for beginners and advanced hobbyists alike. Dues are \$20 per year (US, Canada, Mexico), \$23 all other countries (multiyear discounts available). AGA also sponsors an annual online aquascaping contest and a biennial convention. For more information, visit www.aquatic-gardeners.org.

The Canadian Association of Aquarium Clubs

The Canadian Association of Aquarium Clubs (CAOAC) is a non-profit association of aquarium, herptile, and pond clubs from across Canada and New York State. Some of the things we offer are: a national awards program to honor those in member clubs who have

achieved success in breeding, plant propagation, or other endeavors related to the hobby; a Fish Rescue Program to help those hobbyists with large or unwanted fish to find new homes for them; and a chance to become involved with people who share similar interests. Please visit our website at www.caoac.ca for more information.

East Coast Aquarium Society

The East Coast Aquarium Society is the largest and fastest-growing aquarium club in Atlantic Canada. ECAS actively promotes and encourages aquatic education of freshwater and marine aquaria, aquatic plants, and other related livestock in a fun and informative learning environment. Benefits and privileges of joining include discounts from sponsors and local vendors, auctions and fish shows, and shopping nights at local fish stores. Members also join programs such as the Breeders Award Program (BAP) and the Horticulturalist Award Program (HAP), which offer hobbyists rewards for species breeding and plant propagation. Also held are monthly socials and chat nights. For more information, visit www.eastcoastaquariumsociety.ca

East Coast Cichlids

East Coast Cichlids is an active and friendly group of hobbyists who support each other in the breeding, raising, and care of all fish (not just cichlids). Fun, monthly events are held and online support is always available. Come see what the "buzz" is about! FREE membership! Join us for fish, fun, and friendship! www.eastcoastcichlids.org

Great Lakes Cichlid Society

Join one of the Midwest's top cichlid clubs now celebrating its 20th year in progress. Members come from all states surrounding the Great Lakes area and throughout the nation. The club meets on the fourth Friday of every month, excluding July, 8 p.m. at the Masters Church (771 east 260th St. Euclid, Ohio, 10 minutes east of downtown Cleveland). There are local and national speakers monthly, raffles, breeder award programs, refreshments, and great fish talk. For more information visit www.GreatLakesCichlidSociety.net

International Betta Congress

Founded in 1966, the International Betta Congress (IBC) is a nonprofit worldwide organization promoting the breeding, raising, and study of bettas. IBC actively promotes the selective breeding of various color and finnage strains of bettas through the Sanctioned Show program, where fish are exhibited and judged in pre-defined classes. Our bi-monthly bulletin FLARE! contains articles written by our members and is geared toward the beginner as well as the advanced hobbyist. We have a June Annual Convention hosted by one or more IBC chapters (smaller local groups of betta hobbyists within IBC). As a member of IBC you can join our members-only forum, a free service where you can send and receive group messages, share photos, access IBC-related files, and much more. For further information visit the IBC official website, www.ibcbettas.org

International Fancy Guppy Association

The International Fancy Guppy Association (IFGA) is an organization for guppy breeders and hobbyists interested in breeding and showing fancy guppies. A monthly publication is available and many shows with over 40 color/tail-shape classes are held throughout the country yearly. For more information visit www.ifga.org

Mid-Atlantic Cichlid Keepers

The Mid-Atlantic Cichlid Keepers (M.A.C.K.) is a group of amateur aquarists whose main interest is the breeding, raising, and management of cichlids. Monthly meetings are held from September to May on the 3rd Friday of each month, at 8 p.m. (doors open at 7:30 p.m.), in the Springfield Town Hall building, 50 Powell Road Springfield, PA 19064. For further information, email membership@mackattack.org or visit www.mackattack.org

Mid-Atlantic Koi Club

An active and friendly club for people who are interested in the study and enjoyment of koi, goldfish, and outdoor ponds. Monthly meetings provide a variety of activities, including lectures, pond tours and koi shows, as well as an opportunity to meet other enthusiasts. For information email members@makc.com or visit www.makc.com

The Midwest Cichlid Association

The Midwest Cichlid Association (MCA) is a new and exciting organization, dedicated to the promotion of keeping, breeding, and specialization of the cichlid fish hobby. We eat, sleep, and breathe cichlids! If you would like more information about The Midwest Cichlid Association, please email us at Contact@MidwestCichlid.com or visit www.midwestcichlid.com

North American Discus Association

The North American Discus Association (NADA) is a non-profit organization of discus enthusiasts, hobbyists, and breeders. Our goal is to educate the general public, encourage new members, provide information on the hobby, and promote discus at fish shows. We offer a quarterly newsletter. Please visit our website at www.discusnada.org for more information.

The North American Native Fishes Association

The North American Native Fishes Association (NANFA) is a not-for-profit, tax-exempt corporation dedicated to the appreciation, study, and conservation of the continent's native fishes. The organization seeks to increase and disseminate knowledge about North America's native fishes and their habitats, and to promote the conservation of native fishes and the protection/restoration of natural habitats. It also looks to advance the captive husbandry of North America's native fishes for the educational, scientific, and conservation benefits it affords. For more information, visit www.nanfa.org

Northeast Council of Aquarium Societies

The Northeast Council of Aquarium Societies is a group of aquarium societies in the northeast, where we share information about running an aquarium society and generally bring all members of each of our clubs together. The NEC sponsors an annual general tropical fish convention in March or April each year. www.northeastcouncil.org/nec/

Northwest Killies Club

The Northwest Killies Club (NWK) is an affiliate club of the American Killifish Association. Our intent is to represent the interests of killifish keepers of the Pacific Northwest and beyond. Membership is open to all. Our members are widely scattered, living in various parts of Oregon, Washington, and as far away as Utah. For that reason, we call ourselves a "virtual club," using e-mail to keep in regular contact and meeting physically only four times a year. We also publish a quarterly newsletter. For more information, visit <http://nwk.aka.org>

The Pacific Coast Cichlid Association

Now celebrating its 20th year, the Pacific Coast Cichlid Association (PCCA) meets in San Jose, CA the second Saturday of each month. Meetings feature a presentation (past speakers have included Dr. Paul V. Loisel and Ad Konings) with an auction and raffle following. For more information, write to: PCCA P.O. Box 28145t, San Jose, CA 95159-8145 or visit www.cichlidworld.com

Quad City Fish Keepers

Serving the Mississippi Valley region of Eastern Iowa and Western Illinois. All are welcome from the beginner to the advanced hobbyist, fresh or salt www.qcfishkeepers.com

ARIZONA

Arizona Aquatic Plant Enthusiasts

Meets every third Sunday of the month. See forum for additional details. www.azaquaticplants.com

Arizona Rivulin Keepers

Meets monthly (usually on the second Saturday), 7:00 p.m., Denny's Restaurant, 4403 S. Rural Road, Tempe, AZ. www.ark.aka.org

Dry Wash Aquarium Society

Meets the second Thursday of the month, American Legion Post 105 at 3534 W. Calaver Rd. in Phoenix, AZ at 7 p.m. www.drywashaquarium.org

ARKANSAS

NE Arkansas Reef Club

Meets irregularly, but always available for online support, especially for beginners, and to share wealth of reefkeeping knowledge. www.nea-reefkeeping.com

Northwest Arkansas Aquarium Society (NWAAS)

Contact: (479) 359-0088 - Meets the second Saturday of each month, 7 p.m., at the Rogers Police Department Community Room in Rogers, AR. General interest club, everyone welcome! <http://nwaas.com>

CALIFORNIA

California Betta Society

Afternoon meetings on the fourth Saturday of each month. Check website for location and contact information. www.csbettas.org

COAST Club

Meets 1 to 5 p.m., the first Sunday of each month, the Costa Mesa Neighborhood Community Center, Victoria Room, 1845 Park Avenue, Costa Mesa, CA. www.coastfishclub.com

Golden State Bettas

Meets bimonthly at various locations throughout Southern California. Visit the website for more information. www.goldenstatebettas.com

LA Fish Fanatics

This freshwater fish club meets in the San Fernando Valley, the last Sunday of each month. Contact: 818-370-6930 or email lafishfanatics@hotmail.com

The Marine Aquarium Society of Los Angeles County

Meets the second Friday of every month, Denny's Restaurant, 3060 San Fernando Road in the Los Angeles area, 7 p.m. www.maslac.org

Sacramento Aquarium Society (SAS)

Meets on the first Saturday of each month at 7 p.m. at Round Table Pizza (9500 Greenback Lane) in Folsom. www.sacramentoaquariumsociety.org

San Diego Marine Aquarium Society

Monthly meetings are held on the second Wednesday of every month. Visit the website for locations. www.sdmas.com

San Diego Tropical Fish Society

Meetings the second Sunday of every month, 7 p.m., Room 101 of Casa del Prado, Balboa Park. www.sandiegotropicalfish.com

San Francisco Aquarium Society

Meetings are 6:30 p.m., the first Friday of every month, and are free and open to everyone. sfaquarium.org

Silicon Valley Aquarium Society
Meets are every first Saturday, 6:30 p.m., Round Table Pizza, 4302 Moorpark Ave., San Jose, CA (Rt. 280 & Saratoga Ave.). <http://siliconvalleyaquariumsociety.com>

Southern California Aquatic Plant Enthusiasts
Meetings held on the third Sunday of each month. www.scapeclub.org

Southern California Reef Keepers
Meets at 2642 Cherry Ave. in Long Beach every 3rd Sunday of the month from 6 to 9 p.m. Contact Tana Hsu at 310-930-5537 or visit www.scrk.org

COLORADO

The Colorado Aquarium Society
General meetings the first Friday of each month, 7:30 p.m., St. James Episcopal Church, 8235 W. 44th Ave., Wheat Ridge, CO.

Rocky Mountain Cichlid Association
Meets September through June, 6 p.m., the second Sunday of the month, the Englewood Recreation Center, 1155 W. Oxford Ave., Denver, CO (1/2 mile south of Hampden and one block east of Santa Fe Ave.). www.mcichlid.org

CONNECTICUT

Connecticut Aquatic Plant Enthusiasts (CAPE)
Usually meets the 3rd Saturday of every month at 2 p.m. For locations, email asukavashere@yahoo.com or visit their forum. www.aquaticplantcentral.com/forumapcconnecticut-aquatic-plant-enthusiasts

Connecticut Area Reef Society
Meets monthly at various spots throughout the state, typically the third or fourth Sunday of the month. www.ctars.org

Greater Hartford Aquarium Society
Meets 7:30 p.m. on the fourth Tuesday of every month at the Lutz Children's Museum, 247 South Main Street, Manchester, CT. www.ghasct.org

The Norwalk Aquarium Society
Meets the third Thursday of every month (except July and December), Earthplace, 10 Woodside Lane, Westport, CT. www.NorwalkAS.org

DELAWARE

Delaware Reef Club
Meets the third Monday of every month, 7:00 p.m., at the William Penn High School's main cafeteria in New Castle, DE. www.delreefclub.org

Delaware Valley Reef Club
Visit the website for meeting times and locations. www.delvalreefclub.org

Diamond State Aquarium Society
Meets on the second Monday of each month of the school year, September thru May, at 7:30 p.m. at William Penn High School, 713 E. Basin Road, New Castle, DE 19720. <http://dsas.topcities.com>

FLORIDA

Coastal Aquarium Society
Meets at the Pritzker Marine Biology Research Center at the New College of Florida the first Wednesday of each month at 7:30 p.m. For more information, visit <http://coastalaquariumsociety.com>.

Gold Coast Aquarium Society of South Florida
Monthly meetings with presentations, raffles, and auctions. Details and forum at website. www.goldcoastaquarium.org

Southwest Florida Marine Aquarium Society
Meets on the third Saturday of each month at 3:30 p.m. at The Imaginarium, 2000 Cranford Avenue, Fort Myers, FL (unless otherwise noted on the club website). www.swfmas.com

Space Coast Reef Club
Meets the first Wednesday of each month at 7 p.m. at the Space Coast of Florida. www.spacecoastreelfclub.com

Tampa Bay Aquarium Society
Meets the 2nd Monday of every month at the Florida Aquarium, 701 Channelside Drive, Tampa, FL. Doors open at 7:00 p.m., and the meeting starts at 7:30 p.m. www.tbas1.com

GEORGIA

Atlanta Area Aquarium Association
Meets the first Sunday of every month at 1:30 p.m. in Room 101 of White Hall on the campus of Emory University. www.atlantaaquarium.com

Southeast Georgia Reef Club
Meets on third Tuesday of the month at Shoney's Restaurant in Waycross, Georgia at 7 p.m. www.sgreefclub.com

HAWAII

The Big Island Aquarium Society
Meets the first Friday of every month, the Komohana Agricultural Complex, Hilo, HI, 7 p.m. Contact: Ricky K. Ogata, P.O. Box 6807, Hilo, HI 96720, kazuor@interpac.net

The Honolulu Aquarium Society
Meets the first Friday (except holidays) of each month, 7p.m., the Kuhio Elementary School Cafetorium, 2759 South King Street, Honolulu, HI. www.honoluluaquariumsociety.org

ILLINOIS

Central Illinois Tropical Aquarium Club
Meets the second Sunday of each month. Please visit the centralillinoisistac Yahoo! Group or email david@davidzink.com for more information.

Champaign Area Fish Exchange
Meets the first Saturday of the month (second Saturday for holiday weekends, and no meeting in January or July) at 1125 Plant Sciences Laboratory, 1201 S. Dornier Drive Urbana, IL 61801. For more info, contact Jerry Montgomery at 217-359-6707 or email champaignfishguy1@yahoo.com.

Chicago Killifish Association
Meets the third Saturday bimonthly at the Holiday Inn Select, 1801 N. Naper Blvd., Naperville, at 2 p.m. www.aka.org/chika

Chicago Livebearer Society
Meets four to six times per year. www.chicagolivebearer.com

The Chicagoland Marine Aquarium Society
Meets the second Saturday of each month, 1 p.m., DeVry University, 1221 N. Swift Rd., Addison, IL (unless otherwise noted). www.cmas.net

Greater Chicago Cichlid Association
Meets 7 p.m., the second Sunday of each month, the Holiday Inn Rolling Meadows, close to I-90 & I-290/53. www.gcca.net

The Green Water Aquarist Society of Chicagoland
Meets the first Friday of each month (except July and December), 7:30 p.m., the Alsip Village Hall, 4500 W. 123rd Street, Alsip, IL. www.gwasoc.org

INDIANA

Circle City Aquarium Club
Meets the first Thursday of each month at 7:30 p.m. at

Stonegate Early College High School, 2855 N. Franklin Road, Indianapolis, Indiana. For more information, call Hedy at 317-255-0121, email ranchu2@juno.co

Indy Cichlid Club

The ICC holds monthly meetings where members can meet and discuss the latest information in the hobby. Contact indycichlidclub@gmail.com. www.indycichlidclub.com

Michiana Aquarium Society
Meetings the third Sunday of each month, Jan.-Nov. (second Sunday in June), 6 p.m., the Roseland Town Hall, 200 Independence Dr., Roseland, IN. www.michianaaquariumsociety.org

IOWA

Greater Iowa Reef Society
Reefkeepers' club sharing years of knowledge for success! Monthly meetings include conferences, tank tours, DIY workshops, coral trading, group discounts, guest speakers, and raffles. Save money and find success! www.greateriowareefsociety.org

Iowa Aquaria Association
Meets quarterly, the first Saturday of February, May, August, and November. www.iowa-aquaria.com

KANSAS

The Heart of America Aquarium Society
See the Heart of America Aquarium Society listing under Missouri.

Wichita Aquarium Club
Please visit the website for meeting information. www.wichitaaquariumclub.com

KENTUCKY

Louisville Marine Aquarium Society
Meetings usually the third Sunday evening of the month. www.LMAS.org

LOUISIANA

Southeast Louisiana Aquarium Society
Check our website for meeting times and locations. www.selas.us

MARYLAND

The Capital Cichlid Association
Meetings the second Saturday of every month, 2 to 4 p.m. www.capitalcichlids.org

MASSACHUSETTS

The Boston Aquarium Society
Meets the third Monday of each month, 7:30 p.m., New England Aquarium, The Exploration Center, Central Wharf, Boston, MA. www.bostonaquariumsociety.org

New England Fancy Guppy Association
Typically meets the third Sunday of the month at 1 p.m. Email laurasminskins@comcast.net or check the website for more information. www.newenglandguppies.org

The Pioneer Valley Aquarium Society
Meets the first Tuesday of each month from September through June, the Captain Charles Leonard House, 663 Main Street, Agawam, MA, 7 p.m. www.pvas.net

MICHIGAN

Grand Valley Aquarium Club
Located in Grand Rapids, MI. Meets the second Saturday of each month, 7 p.m., after a half-hour social period, the Holiday Inn Express, 6569 Clay Ave SW, just off Highway 131, at the 68th street exit. www.grandvalleyaquariumclub.org

The Greater Detroit Aquarium Society
Meets the fourth Wednesday of every month (unless otherwise noted), the Good Shepherd Lutheran

Church, 814 North Campbell Road, halfway between 11 and 12 Mile Road, Royal Oak, MI, 8 p.m. <http://greaterdetroitaquariumsociety.org>

Michigan Aquatic Plant Group
Check forum for meeting times and locations. www.miapg.com

Motor City Aquarium Society
Meets the second Thursday of every month, St. Gertrude's Religious Education Building, 28839 Jefferson St., Clair Shores, MI, north of Martin Rd. (11 1/2 Mile Rd.) near the Blue Goose Restaurant. Enter from the back of the building. Doors open 7:30 p.m. www.motorcityaquariumsociety.com

Southwestern Michigan Aquarium Society
Meets at 8 p.m. on the first Friday of each month at Kalamazoo Valley Community College's Advanced Technology Center, at 6767 West "O" Avenue in room 5830, in Kalamazoo, MI. www.swmas.org

MINNESOTA

Minnesota Aquarium Society
Meets the first Thursday of every month (except July) at King of Kings Lutheran Church at 2330 N. Dale St., Roseville, MN 55113. Meetings begin promptly at 7:30 p.m. www.aquarium.mn

MISSOURI

Heart of America Aquarium Society of Kansas City
Meets the second Saturday of the month at Bridge View Hall in North Kansas City. <http://kcfishclub.org>.

The Missouri Aquarium Society
Meets the third Thursday of each month, 7:30 p.m., the Dorsett Village Baptist Church, 2240 Bennington Place, Maryland Heights, MO 63043. www.missouriaquariumsociety.com.

Saint Louis Area Saltwater Hobbyists
See website for meeting dates and time. www.slashclub.org

NEW HAMPSHIRE

The New Hampshire Aquarium Society
Meets the second Wednesday of every month, September through June, 7 p.m., Somersworth, NH High School/Vocational School. www.nhaquariumsociety.com

NEW JERSEY

Jersey Shore Aquarium Society
Meets the second Monday of the month, Knights of Columbus Hall, 70 E. Main St. (Rt. 537), Freehold, NJ, around 8 p.m. www.jerseyshoreas.org

The Metropolitan Area Killifish Association
Meets the fourth Wednesday of the month (third Wednesday in November and December), the Meadowlands Environment Center, Lyndhurst, NJ. www.aka.org/maka

New Jersey Tri-State Tropical Fish Association
Meets monthly, 7 p.m., the Barrington Municipal Building, 229 Trenton Avenue, Barrington, NJ. Contact: Bill Farrell, President, at 856-428-1431 or fish4thought0321@aol.com

North Jersey Aquarium Society
Meets every third Thursday of the month (except August and December) at the Lyndhurst Elks Club, 251 Park Avenue, Lyndhurst, NJ 07071. Doors open at 7:00 p.m.; meeting starts promptly at 7:45 p.m. www.njas.net

The South Jersey Guppy Group
Meets the third Sunday of each month, 1 p.m., the Griggstown Firehouse in Princeton, NJ. Contact: Dave Polunas at 732-329-9597 or email daveguppy@aol.com

NEW YORK

Brooklyn Aquarium Society

Meets the second Friday of the month, 7:30 p.m., the New York Aquarium's Education Hall, Coney Island, Surf Ave. and West 8th St., Brooklyn, NY. www.brooklyn-aquarium-society.org

Capital District Marine Aquarist Society

Meetings are informal and held once per month at a volunteering member's home. www.cdmas.org

Central New York Aquarium Society

Meets 7 p.m., the third Wednesday of every month (except July and August), at the Dewitt Community Center, 148 Sanders Creek Pkwy, East Syracuse, NY. www.cnyas.org

Danbury Aquarium Society

Meets the fourth Friday of each month (except July and December), 8 p.m., the Carmel Ambulance Corps, Vink Road, Carmel, NY. www.northeastcouncil.org/daas

The Greater City Aquarium Society

Meets the first Wednesday of each month (except January and February), the Queens Botanical Garden, Queens, NY 7:30 p.m. www.greatercity.org

Hudson Valley Reefkeepers

Group meets monthly at a member's home. Visit the events section of the website for more information. www.hvreef.org

Long Island Aquarium Society

Meetings are the third Friday of every month (except July and August) at 8 p.m. at Stony Brook University. www.liasonline.org

Long Island Reef Association

Meets the first Friday of the month. See website for location and speaker. www.longislandreef.org

Nassau County Aquarium Society

Meets the second Tuesday of the month (except July & August). www.ncasweb.org

NORTH CAROLINA

Raleigh Aquarium Society

Meets the first Thursday of each month, the North Carolina State University School of Veterinary Medicine; downstairs, across from the library, 7:30 p.m. www.raleigh-aquarium-society.org

Reef Aquarium Society of Charlotte

Meets every third Saturday of the month, 2 to 4 p.m. www.rasoc.org

Western North Carolina Aquarium Society

Meets from 7 to 9 p.m. on the third Thursday of every month in the Aquarium & Planetarium Building at the Catawba Science Center, located at 243 3rd Ave. NE in Hickory, NC 28603. Freshwater and saltwater aquarium enthusiasts welcome. Contact: Scott Arney at cichlidz1@aol.com

OHIO

The Cleveland Aquarium Society

Meets the first Tuesday of the month, the Cleveland Zoo educational building, just inside the main gate, 8 p.m. www.cleveland-aquarium-society.org

Columbus Area Fish Enthusiasts (CAFE)

Meets bimonthly in Columbus, OH. www.columbusfishclub.org

The Greater Akron Aquarium Society

Meets the first Thursday of each month, the Tallmadge Community Center, 80 Community Drive, Tallmadge, OH. www.gaas-fish.net

The Greater Cincinnati Aquarium Society

Meetings the last Sunday of the month (may vary with speaker and event schedules), 7:30 p.m., the Winton Woods Visitor's Center, 10245 Winton Road, Cincinnati, OH 45231. www.gcas.org

Medina County Aquarium Society

An all-species club located in Medina, OH. See website for meeting dates and times. www.mcas-fish.net

The Ohio Cichlid Association

Meets the first Friday of every month (except July, because of the ACA convention), the Old Oak Bible Church, 7575 Old Oak Blvd., Middleburg Hts., OH (north of Fowles Road). Doors open 7:30 p.m., meeting promptly at 8 p.m. www.ohiocichlid.com

Stark County Aqua Life Enthusiasts Society

Meets the third Sunday of every month at the Perry Grange Hall, 6300 Richville Dr. SW., Massillon, OH 44646. Meetings are from 5 p.m. to 7:30 p.m. For more information, contact John or Theresa Baad at 330-452-9027, or visit the website. www.scalesclub.com

Youngstown Area Tropical Fish Society

Meetings the third Friday of each month, the Presbyterian Church, Mineral Ridge, OH, 7:30 pm. www.yatfs.com

OKLAHOMA

Oklahoma Aquarium Association

Statewide organization with chapters in Tulsa, Stillwater, and Oklahoma City. Meets monthly. For more details, call 405-263-4769 or visit the website. www.theokaa.org

OREGON

The Greater Portland Aquarium Society

Meets the fourth Tuesday of each month, 7 p.m., the Fellowship Masonic Center, the corner of 57th and Sandy, Portland, OR. www.gpas.org

PENNSYLVANIA

The Aquarium Club of Lancaster County

Meets the third Saturday of each month except July and August. For more information, visit www.aclcpa.org.

The Bucks County Aquarium Society

Meets the first Thursday of every month, the Churchville Nature Center, Churchville, PA, 7:30 p.m., doors open 7 p.m. www.bcasonline.com

The Delaware County Aquarium Society

Meets the first Friday of every month, except July and August, the Springfield Municipal Building, Springfield (Delaware County), PA. Doors open 7:30 p.m., meeting at 8 p.m. www.dcas.us

Erie Aquarium Society of Erie Pennsylvania

Contact: Erie Aquarium Society, P.O. Box 8025, Erie, PA 16505. Meets 7:30 p.m., the second Wednesday of each month, the West Ridge Fire Station, 3142 West 26th Street (Route 20) & Homer Avenue, Erie, PA 16506. <http://groups.yahoo.com/group/erieaquariumsociety>

Greater Pittsburgh Aquarium Society

Regular meetings usually the last Friday of the month, the Phipps Garden Center, corner of Fifth Ave. and Shady Ave. (Mellon Park). Doors open 7 p.m., meeting at 7:30 p.m. www.gpasi.org/index.html

Mason Dixon Reef Club

Also serving Maryland; all meetings open to public. Check our website for times/locations. www.mdreefclub.com

Pennsylvania Fish Culturist Association

Meets the second Thursday of every month (except July and August), 7:30 p.m., Lawncrest Recreation Center, 6000 Rising Sun Avenue, Philadelphia, PA 19111. Contact: Bill: 856-428-1431, or e-mail: farfish403@aol.com

The Philadelphia Area Reef Club

Meetings first Wednesday of each month, the Katherine Drexel Library, 11099 Knights Rd., Philadelphia, PA 19154. Contact: p.a.r.c@home.com

Pittsburgh Area Planted Aquarium Society

Dedicated to planted aquaria. Meetings are typically held at 2:00 p.m. on the first Sunday of the month at A and B Oddball Pets and Aquariums, 262 Joseph St., Pittsburgh, PA. www.homeofpapas.org

RHODE ISLAND

Tropical Fish Society of Rhode Island

Meetings are the third Wednesday of the month at 7:30 p.m. (no meeting in December). Meetings are held at the Rhode Island Society for the Prevention of Cruelty to Animals (RISPCA) at 186 Amaral St., Riverside, RI 02915. www.tfsri.net

SOUTH CAROLINA

Columbia Marine Aquarium Club

For location and meeting times, visit the website. www.columbiamac.org

Palmetto Marine Aquarium Club

For meeting times and location, visit www.palmettomac.com.

South Carolina Aquaria Association

Visit the website for meeting information. www.scaquariasociety.com

TENNESSEE

Music City Aquarium Association

Visit the website for meeting times and locations. www.mcaafish.com

TEXAS

Dallas Marine Aquarium Society

Meetings are held on the second Saturday of each month. Visit the website for more information. www.dallasmas.org

Dallas-Ft. Worth Marine Aquarium Society

Meetings every third Wednesday of the month, around the DFW Metroplex. www.DFWMAS.com

Dallas Killifish Association

Meets the first Saturday of the month at 6 p.m. Check website for date and location. www.dallaskillifish.com

Greater Houston Aquarium Club

Meets at a member's home on the third weekend of each month. Visit the website for time and location, or contact stevecgg@myghac.org. www.myghac.org

The Hill Country Cichlid Club

Serving the I-35 corridor including Austin, San Antonio, and the rest of the Texas Hill Country. www.hillcountrycichlidclub.com

Houston Aquarium Society

Meets the fourth week of the month, varying locations. www.houstonaquariumsociety.org

Texas Cichlid Association

Meetings the third Saturday evening of each month. www.flash.net/~tcichlid

UTAH

The Great Salt Lake Aquarium Society

Meets the second Thursday of each month at the Garden Center, Sugarhouse Park, 1601 E. 2100 Street, Salt Lake City, UT. Doors open 7 p.m., programs, 7:30 p.m. www.gslas.com

Utah Marine Aquarium Society

Meetings held at the Living Planet Aquarium on the third Thursday of every month. www.utmas.com

Wasatch Marine Aquarium Society

Meetings the first Thursday of each month. www.utahreefs.com

VERMONT

Otter Valley Aquarium Society

Meets the second Tuesday of the month at 7:30 p.m. (except July & August) at the Madure Library in Pittsford, Route 7 North. jtoddybas@aol.com

Tropical Fish Club of Burlington, VT

Meets monthly September through June, the second Thursday of the month, at the VFW, 73 Pearl St, Essex Junction, VT. www.tfcb.org

Vermont Marine Aquarists

Meets quarterly when there is interest. Contact engstrom@gmail.com for more information. www.saltwatervt.org

VIRGINIA

Potomac Valley Aquarium Society

Meets the first Saturday of each month at the Green Acres School, 4401 Sideburn Road, Fairfax, VA. Doors open 12:30 p.m., meeting begins at 1:00 p.m. www.pvas.com

Shenandoah Valley Aquarium Club

Meetings are held on the last Sunday of each month from 4 p.m. until 5 p.m. at the Burger King in Verona, VA. For more information, check www.svac.co and our Facebook page (Shenandoah Valley Aquarium Enthusiasts).

WASHINGTON

Greater Seattle Aquarium Society

Meets the second Tuesday of every month, except July and August. Plant auction in February, big auction in April. www.gsas.org

Inland Northwest Aquarium Society

Meets the first Wednesday of every month, 7 p.m., Aquarium Solutions, 9516 E. Montgomery Ave, Ste. 18, Spokane Valley, WA. www.inwas.org

Seattle Saltwater Fish Association

Meets biweekly in west Seattle, Washington. Contact: Kristine at 206-935-3212 or email kvillager@gmail.com

WASHINGTON D.C.

The Chesapeake Marine Aquaria Society

Meets monthly in the Greater Washington/Baltimore area. See website for more details. <http://www.cmas-md.org>

WISCONSIN

Central Wisconsin Aquarium Society

Meets at least once monthly, and auctions (spring and fall), shows (before fall auction), and other outings are held. www.cwas.org

Green Bay Aquarium Society

Meets the second Wednesday of each month at the home of a club member. <http://www.gbasonline.org>

Madison Area Aquatic Hobbyists

Meets monthly on the third Saturday of the month. <http://madisonaquatic hobby.com>

The Milwaukee Aquarium Society

Meets the third Friday of every month (except July and December), Hoffer's Tropic Life Pets, 7323 N. 76th St., Milwaukee, WI. www.milwaukeeaquariumsociety.com

Sheboygan Aquatics Society

Meets the second Wednesday of each month. For more information, visit www.sheboyganaquaticssociety.org.

AUSTRALIA

Australia New Guinea Fishes Association

Contact: membership@angfa.org.au, PO Box 673, Ringwood Vic 3134, Australia. www.angfa.org.au

Wide Bay Aquarium Society

Visit the website for meeting times and locations. www.wbaqs.com

CANADA

The Aquarium Society of Winnipeg

Meets every third Sunday, September through June, theatre 100 at St. Paul's College, University of Manitoba, 70 Dysart Road. www.asw.ca

Association Regionale des Aphiles de Quebec

Meets 7:30 p.m. on the second Monday of every month at 2125 Louis-Joliet, Quebec, QC. www.araq.org

Brant Aquarium Society

Monthly meetings are held on the second Wednesday of each month, September to June, at TB Costain Community Centre at 12 Morrell St., Brantford, Ontario. www.brantaquariumsociety.ca

Calgary Aquarium Society

Meets the second Tuesday of each month. Visit the website for time and location. www.calgaryaquariumsociety.com

Canadian Killifish Association

Meets monthly, the second Sunday, 1 p.m. Location changes month to month. www.cka.org

The Canadian Rift Lake Cichlid Association
Quarterly meetings, the University of Guelph, Arboretum Nature Centre in Guelph, Ontario. www.crlca.com

Chatham-Kent Aquarium Society

Meets every second Saturday (except Jan and July) at Chatham Chrysler from 11 a.m. to 1 p.m. <http://chathamkentaquariumsociety.webs.com>

Durham Region Aquarium Society

Monthly meetings, the second Tuesday of each month, 7:30 p.m., Anderson Collegiate, 400 Anderson St., Whitby, Ontario. www.dras.ca

East Coast Aquarium Society

Based in Halifax, Nova Scotia. Monthly meetings from September to June. www.EastCoastAquariumSociety.ca

Hamilton & District Aquarium Society

Meets on the second Thursday of every month at 7:30 p.m. (except July and August) at the Church of the Resurrection, located at 435 Mohawk Road West, Hamilton, Ontario. www.hdas.ca

Kitchener Waterloo Aquarium Society

Meets the first Tuesday of every month (except July and August). www.kwas.ca

The London Aquaria Society

Based in London, Ontario, Canada. Meetings the second Tuesday of every month, 7:30 p.m., except July and August. www.londonaquariasociety.com

Montreal Aquarium Society

Meets the second Wednesday of each month, except in July and August. www.themontrealaquariumsociety.com

Ottawa Valley Aquarium Society

Meetings are the fourth Monday of every month (except July, August, and December) at 7 p.m. at the Mel Baker Hall of J.A. Dulude Arena at 941 Clyde Avenue, Ottawa, Ontario. www.ovas.ca

Peel Regional Aquarium Club

Meetings the third Thursday of the month, September to June, 7 p.m., Turner Fenton Secondary School, 7935 Kennedy Road South. www.peelaquariumclub.org

Saskatoon Aquarium Society

Meets at the Calvin-Goforth Presbyterian Church at 1602 Sommerfeld Ave. (corner of 3rd and Sommerfeld) on the last Sunday of each month at 1:30 p.m. www.saskatoonaquarium.com

The St. Catharines & Area Aquarium Society

Meets every third Thursday of the month (except August

and December) at The Seafarers and Teamsters Union Hall, 70 St. David's Rd. E., Thorold, ON. Doors open at 7:00 p.m.; meeting starts promptly at 7:45 p.m. Visit us at our website or call 732-541-1392. www.scaas.info

Sarnia Aquarium Society

Meets 7:30 p.m., the second Tuesday of each month, the British Canadian Club, 375 Vidal Street South., Sarnia, Ontario, Canada. www.sarniaaquariumsociety.com

Société d' Aquariophilie de Montréal (S.A.M.)

Meetings are on every third Tuesday of the month, except July and August, held at 75 Sir Georges-Etienne Cartier in Montreal, Canada; events include conferences, breeder awards, and auctions. www.aquasam.qc.ca

Toronto Willowdale Aquarium Society (TWAS)

Serving the megacity of Toronto. For more information, email us at info@torontoaquarium.org or visit www.torontoaquarium.org

Vancouver Aquatic Hobbyist Society

See website for meeting times and contact information. <http://vahs.ca>

Wet Coast Aquarium Society

Meets the second Monday of the month at 7:30 p.m. at The University of British Columbia. <http://wetcoastaquariumsociety.ca>

INDIA

Indian Aquarium Hobbyist Portal

Dedicated to aquarists of India, bringing them together, addressing lack of specific information in the hobby and providing useful resources. www.iah.in or visit us at our website www.indiaaquariumhobbyist.com

ITALY

Club Ittiologico Romano "Giancarlo Iocca"

Meets the last Thursday of each month. Visit the website for time and location. www.cir.roma.it

The Gruppo Acquariofilo Salentino

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Meets in San Juan, every first Saturday, 1:30 p.m., Interamerican University Metro, 426. www.amepr.org

Asociación de Acuaristas de Aguadilla

Meets every second Sunday at 1:30 p.m. at Esc. Esther Feliciano de Mendoza, Ramey Base, Aguadilla, PR. Contact: camatos99@yahoo.com www.aaapr.org

If your club would like to be included in "Meeting Place," please contact Tsing Mui at tmui@tfh.com

aquarium society news

Amanda Wenger

Norwalk Aquarium Society Fish Show

The Norwalk Aquarium Society (NAS) held its annual fish show and auction the weekend of September 29, 2012. The local event is one I've attended for several years now, and it always proves to be a great way to spend a weekend. The show is held in a local nature center called Earthplace, which is also the regular meeting place of the NAS.

Setup for the fish show began on the evening of Friday, September 28 and continued until noon on Saturday. Perhaps due to the regularly scheduled meeting of the nearby Danbury Area Aquarium Society on Friday night, most of the entries were set up on Saturday. Nonetheless, the show garnered 111 entries across 29 classes, a significant increase from the previous year. These included traditional single-fish classes as well as fish in pairs, families, and novelty setups.



Norwalk Aquarium Society President Barry Lynch presents newcomer Tom Sands with the Best of Show award.

First-time exhibitor Tom Sands claimed both the Best of Show and Reserve of Show awards. The Best of Show went to his male pearl cichlid (*Geophagus brasiliensis*), and the reserve fish was a beautiful *Synodontis* catfish.

The NAS show also hosted the annual show of the Connecticut Betta Club, the local chapter



The Connecticut Betta Club had a competition of its own during the NAS Fish Show.

of the International Betta Congress. A classroom normally used for children's educational programs was devoted solely to the dozens of *Betta* specimens displaying all manner of colors and fin types.

On Sunday, after the show, the awards and prizes were presented. Immediately afterward began the auction, which offered a variety of aquarium-related lots furnished by both the members and the kind donations of a number of companies.

This was a fun weekend for any hobbyist, and I look forward to attending it again next fall. In the interim, NAS holds a spring auction each year in March—get the details on their schedule from their website at <http://norwalkas.org>.

Amanda Wenger

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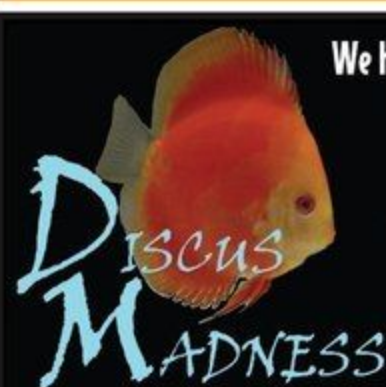
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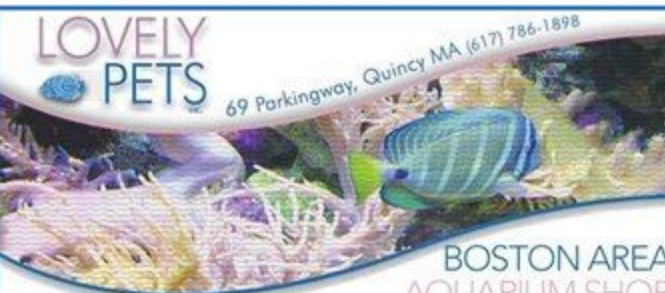
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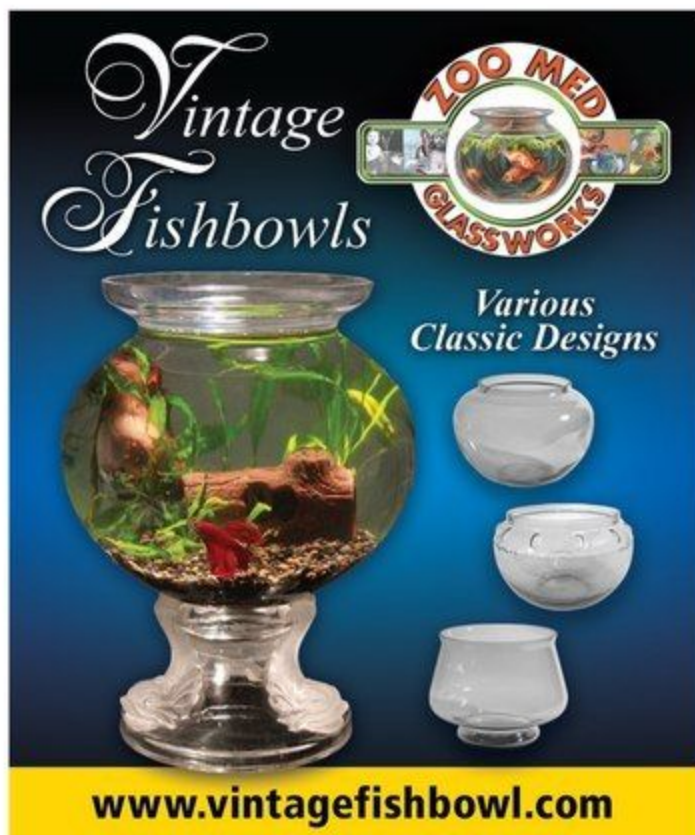
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Product Spotlight



Fluorescent Hoods

ZooMed offers a lineup of AquaSun Quad T5 HO Linear Fluorescent Hoods. Designed specifically for high-output T-5 lamps, these feature a sleek, low-profile design, a four-lamp capacity for custom lighting blends, and dual switches for greater lamp control. Also included are dual high-output T5 electronic ballasts, a clear splash guard for lamp protection, and an internal reflector that maximizes lumen output. The durable housing is aluminum and rust-free. Available in 24, 30, 36, and 48 inch sizes. For more information, visit www.zoomed.com.

Airline Kit

Lifegard Aquatics presents a completely packaged Airline Bulkhead Kit, designed to hide unsightly airline tubing rather than drape it over the top and into your tank. Customers can pre-order or simply drill a 1½-inch diameter hole in the bottom or side of the aquarium tank. The hang- or stand-packaged kit includes an airline bulkhead with gasket and lock nut, 6 feet of airline tubing, two check valves, elbow fitting, and complete instructions. When attached to an air pump, it can be used to drive any air stone or aquarium toy device. For more information, visit www.lifegardaquatics.com.



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Submissions: *Tropical Fish Hobbyist* • Product Spotlight • One TFH Plaza, Third and Union Aves. • Neptune City, New Jersey 07753
Attn: Tsing Mui • Email: tmui@tfh.com • Presentation in the "Product Spotlight" is purely informational and does not constitute an endorsement of the products by *Tropical Fish Hobbyist*. All submissions may be edited for length and content.

in next month's issue...

collecting for kids

Do you want to get your children as excited about the hobby as you are? One of the best ways is to take them out into the wild and have them see fish in their natural habitat, which is exactly what one author did when he took an entire camp collecting in French Creek.



Zachary Piso

creating live rock

As every reef hobbyist knows, live rock is an essential component of the structure of a reef tank and is necessary for biological filtration too. However, some live rocks are collected in an unsustainable manner. For the hobbyist looking to save some money and be eco-friendly, creating your own live rock is the way to go.



Doberman/er/Shutterstock

carnivorous plants

When thinking of aquatic plants, stealthy predators with lethal skills probably do not come to mind, but there are such plants out there. These unique plants find, trap, and digest their prey just like animals do. As one aquascaper explains, these distinct plants are fascinating to behold in the aquarium.



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Read About All This and Much, Much More
in the March 2013 Issue of *TFH*!

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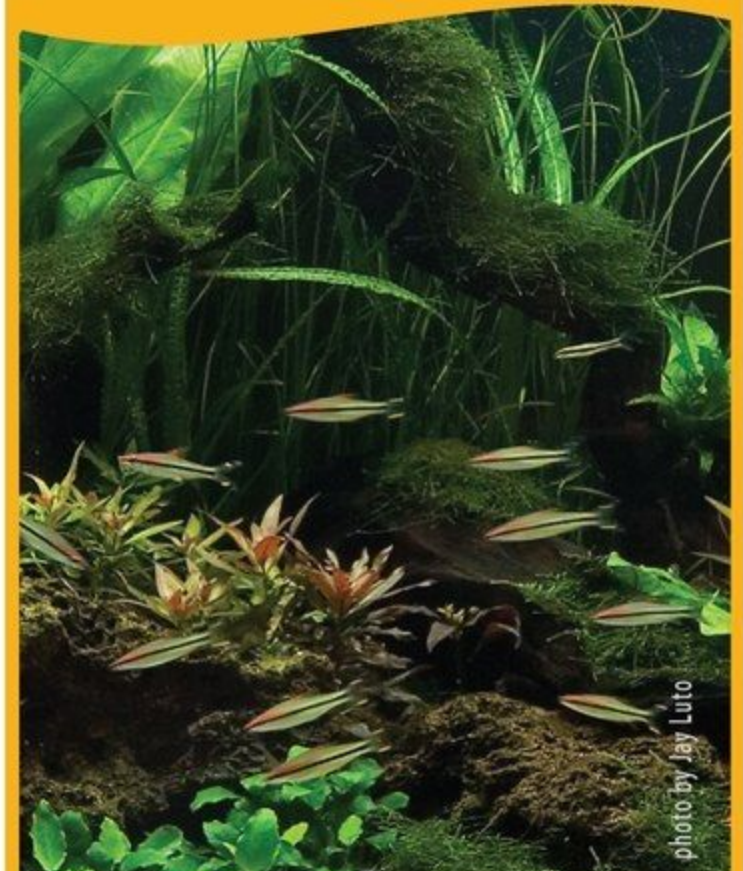


photo by Jay Luto

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PARTING SHOT

Photo: Kim Yusuf

dancing shrimp

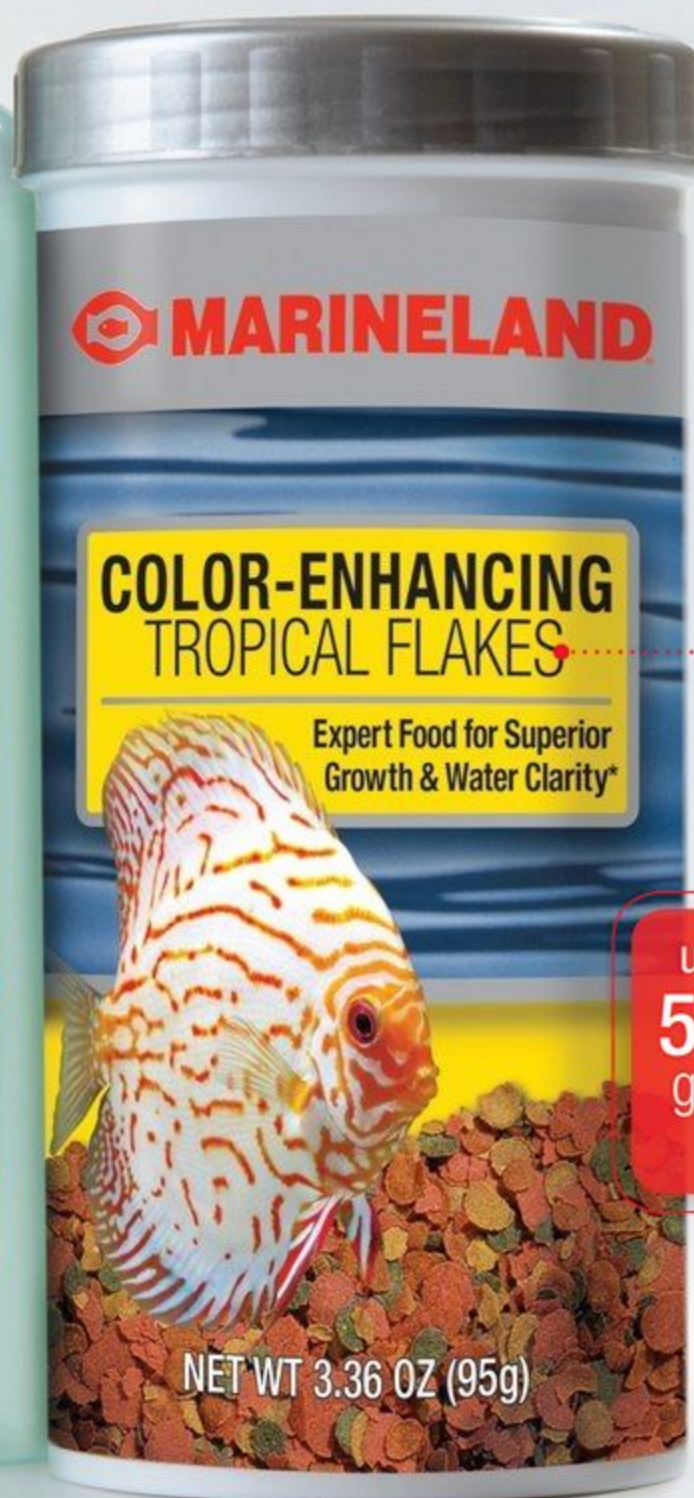
(*Rhynchocinetes durbanensis*)

A magnifier can be a handy lens accessory for revealing the minute details of organisms encountered in the ocean depths. Using a 100mm macro lens and a magnifier with a +10 diopter, Kim Yusuf (www.liquid-kingdom.de) was able to capture the intricate details of this dancing shrimp (*Rhynchocinetes durbanensis*) in the waters of Bali, Indonesia.

The original scale of this tiny creature (under 2 inches) is amusingly veiled by this larger-than-life capture, which exposes a variety of details normally hidden to the casual observer. One of the more striking features of the shrimp's physiology is its compound eyes and individual ommatidia (photoreceptor clusters), the lattice pattern of which is made abundantly clear by the lighting employed for the invert's proper exposure.

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