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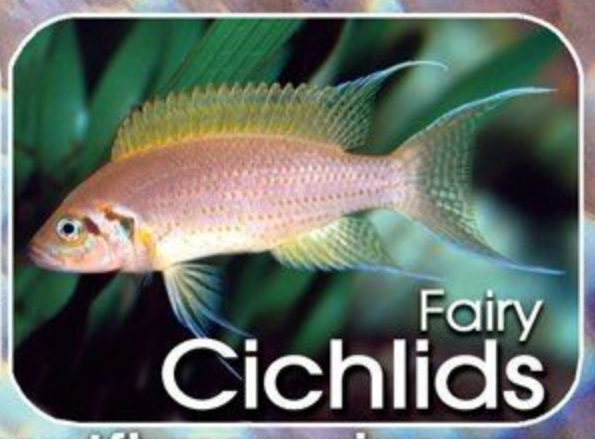
PLANTED TANK BASICS

KEEPING SEXY SHRIMP



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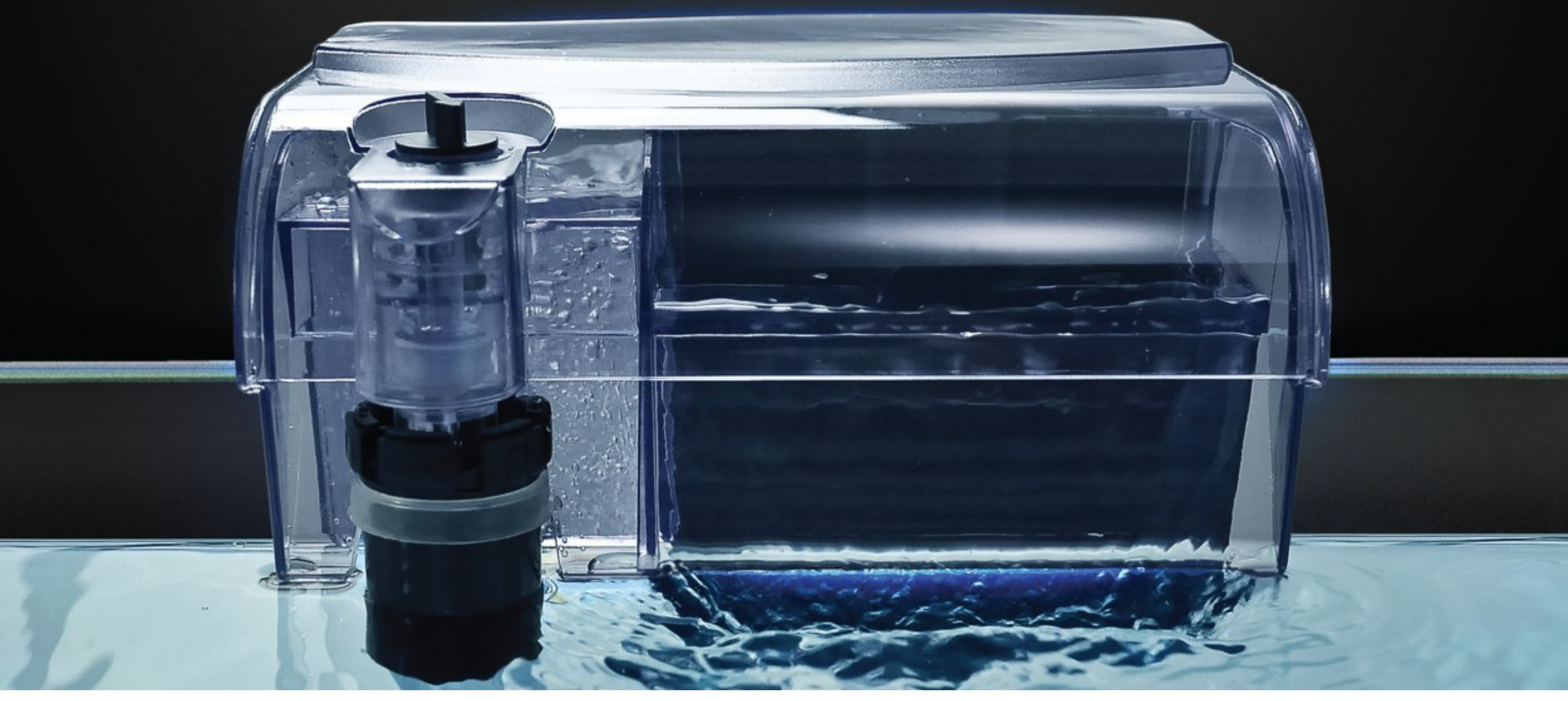

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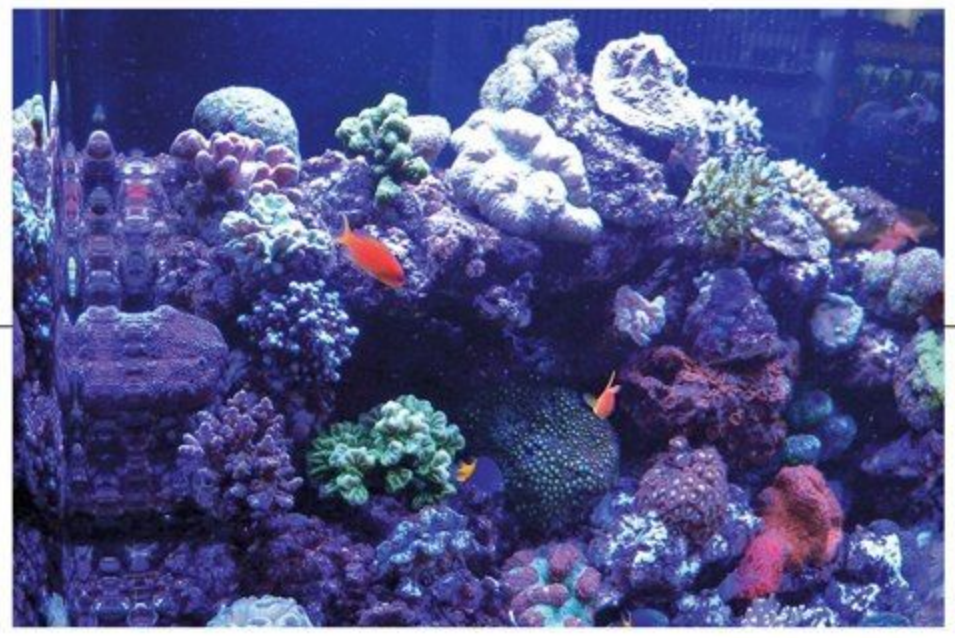


98

features

54 A Simple *Iwagumi* Layout with *Unzan-seki* Stones
The aquascaping master explains how the impression of an *iwagumi* layout can change based on a number of factors, such as the type of rock used. **Takashi Amano**

60 The Fairy Cichlids of Lake Tanganyika
Pretty, peaceful, and full of personality, fairy cichlids are sure to delight you with their antics as they establish a colony in your tank. **Mike Hellweg**

66 Breeding the Morpho Characin
Featuring splendid colors and finnage, the morpho characin is an unusual fish that makes a great choice for anyone looking for a new breeding challenge. **John Robertson**

70 Outdoor Pond Basics
Setting up a garden pond can seem like a daunting project, with myriad layout and equipment choices to consider, but an expert pondkeeper explains the relative advantages of each type and how to install a gorgeous water feature in your own backyard. **Lea Maddocks**

78 A No-Fuss Planted Aquarium
If you want a lush planted tank for your home but aren't ready to commit to a high-tech aquascape, there are some basic techniques that can help you create a beautiful, simple, low-cost setup. **Michael Grossman**

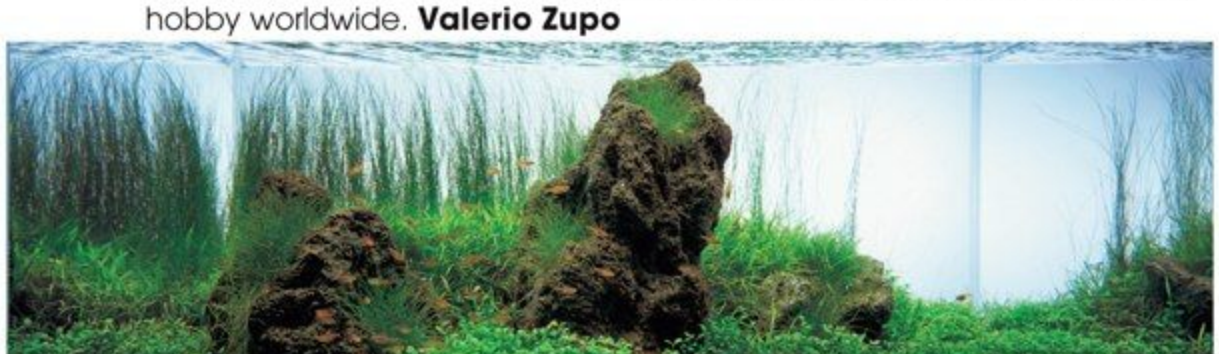
82 A New Crab from South Asia: *Geosesarma bicolor*
A striking addition to a terrarium with a freshwater feature is *Geosesarma bicolor*, a colorful crab from South Asia that is easy to keep and breed. **Uwe Dost**

86 An Aquarist's Journal: Starting in the Fishkeeping Hobby
Sometimes doing everything wrong can help you learn how to do everything right. One lucky young aquarist certainly learned that way, starting off with a 10-gallon predator tank that eventually turned into a huge predator pond. **Tobias Lim Koon Li**

92 Keeping Sexy Shrimp
When it comes to nano tanks, small, playful residents are key, and perhaps none are more appropriate for a nano reef setup than dancing, gorgeous sexy shrimp. **Richard Aspinall**

98 Interzoo 2012: Not Your Typical Fish Show
The biannual pet fair Interzoo is a premier event for the aquatics industry, showcasing the latest trends, equipment, and livestock for the aquarium hobby worldwide. **Valerio Zupo**

16



54

columns

30 Ask Jack
Jack Wattley

32 Cichlid World
Eric Hanneman, PhD

36 Import Report
Robert Paul Hudson

40 Life with Livebearers
Charles Clapsaddle

44 Adventures in Aquascaping
Mark Callahan

48 The Salt Mix

cover

Sexy shrimp (*Thor amboinensis*) make colorful, active, and just plain fun additions to any reef—especially a nano reef. When kept in small groups, they will live up to their name, dancing for each other (and you) on anemones and other similar corals. As marine author Richard Aspinall suggests, these charming shrimp are perhaps the perfect choice for nano aquaria based on their small size, simple diets, ease of breeding, and compatibility with like species. Read all about these delightful inverts in "Keeping Sexy Shrimp" (p. 92).
Photograph by Kar Seng Sim
Our cover photo is available for your wallpaper and/or screensaver in the downloads section of tfhmagazine.com.

departments

8 Editor's Note/Reader's Forum

10 Contributors

12 Online Extras

14 Feature Photo

16 Freshwater Q&A

24 Saltwater Q&A

102 Meeting Place

105 Aquarium Society News

106 Classifieds

108 Product Spotlight

110 Advertiser Index

112 Parting Shot

70

24

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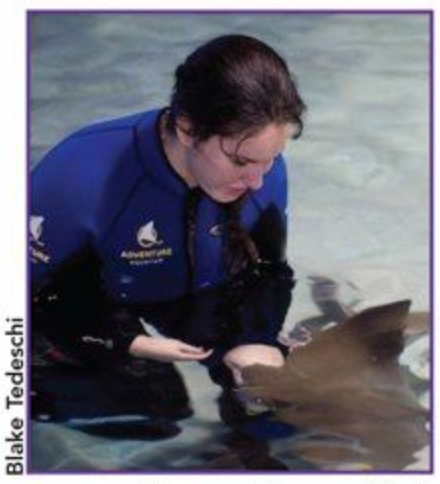
editor's note


Blake Tedeschi

The sunshine of summer in full swing tends to draw people outdoors, whether it's to enjoy a barbeque with friends, play a pick-up game of volleyball, or go for a refreshing swim. But why not bring your hobby with you and allow your fish to enjoy the season too?

The most obvious way to enjoy outdoor fishkeeping is to set up a pond. What you may not know is exactly how many different types of ponds you can create. There are the ever-popular pre-formed ponds that come in a range of shapes and sizes and are easy to install; you can use a pond liner and create a uniquely shaped pond that corresponds to your vision; you can use concrete to form a large, permanent pond; or you can even have a raised pond or water feature that can fit into almost any space. Pond expert Lea Maddocks explains the advantages and disadvantages of all of these types of ponds, as well as how to install and maintain them (p. 70).

Then there's the question of stocking a pond. Although many people choose to go with the nearly ubiquitous koi and goldfish, there are plenty of other options. One you might not think of is creating a pond full of tankbusting predators. Tobias Lim Koon Li realized his collection of predators would no longer fit into reasonably sized indoor glass aquariums, so he ultimately created a 13,000-gallon pond for them. Complete with arapaima, red-tail catfish, arowanas, a Fly River turtle, and much more, this pond is not to be missed (p. 86)!

For those of you who don't have the room for a pond or are not planning to set something up outdoors, there is always the option of using the summer to visit fish in their native habitat. "Cichlid World" columnist Eric Hanneman did just that, visiting Panama to go collecting. There he found a number of South and Central American cichlids sure to impress any cichlid enthusiast (p. 32).

And speaking of interesting aquatics destinations abroad: Interzoo, billed as "the world's most important meeting place for the international pet industry," is a biannual event held in Nuremburg, Germany, and it is a fantastic venue to see the latest and greatest aquatics equipment, newly imported species, and the best in creative setups. There were even aquascaping lessons offered by the masters throughout the show (p. 98).

But if going outside just isn't your thing no matter how nice the weather may be, there are still plenty of options for staying indoors. You can set up an aqua-terrarium for a colorful new crab (p. 82), design a low-maintenance, low-budget planted tank (p. 78), or take on the formidable challenge of breeding morpho characins (p. 66). On the salty side, a new nano reef would be the perfect place to house a sexy shrimp (p. 92).

Whatever you choose to do, make sure to enjoy the rest of your summer!

Shari Horowitz
Managing Editor
Tropical Fish Hobbyist

readers' forum

Facebook Readers Respond: What was the first type of fish you ever kept? Do you still keep it today?

Banjo catfish. My LFS had them when I first started keeping fish tanks, and I immediately fell in love with them. I now work at that same pet store as the aquatic specialist, and I still have those same catfish to this very day.
Cody Sutton

Blackspot barbs are the first fish that I've really invested energy in caring for. I had other fish and did really good with them, but something about these guys makes me want to take it beyond just a box of water. The school is getting a 90-gallon biotope next year.
Robert Ducky McAuslan

Weather loach! Still going strong, it's a complete nutcase of a fish.
Scott Campbell

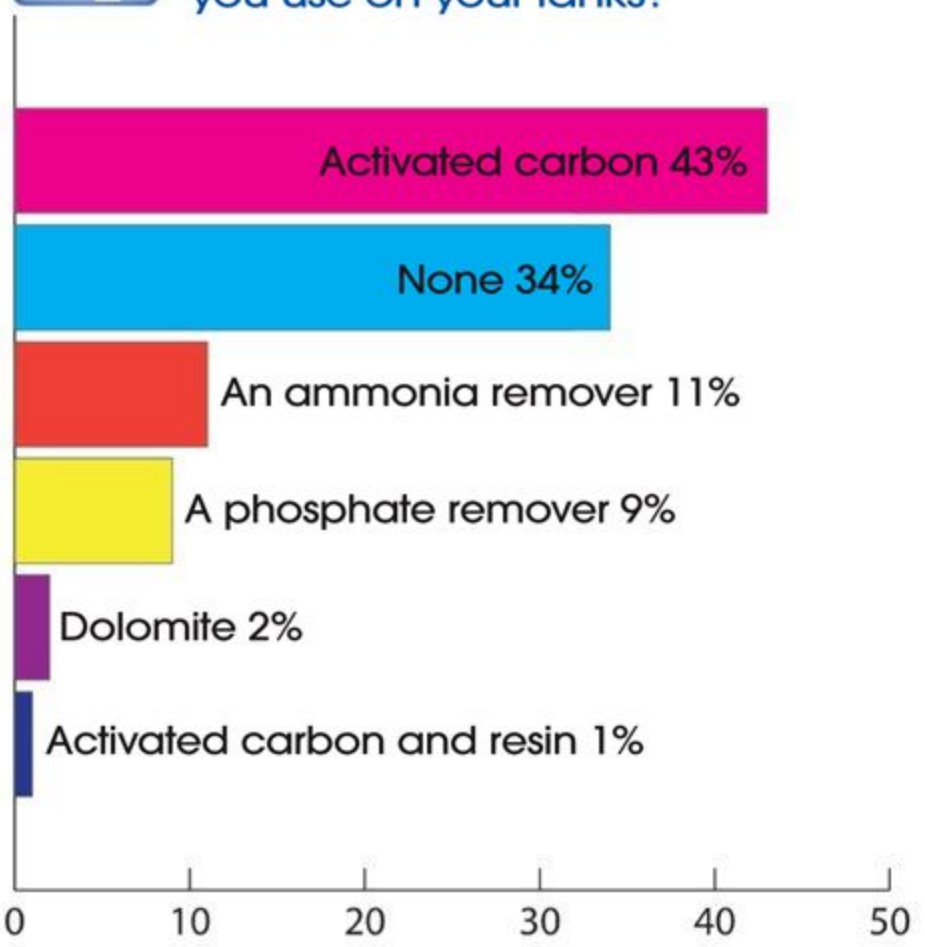
Apart from the goldfish my parents bought for me when I was a kid, I got into tropical fish about 45 years ago, and the first ones I had were black widow tetras. At the moment I have three of them in one of my tanks. They have always been my favorite.
John Stone

Apart from guppies and swordtails, my first impressive fish was the pearl gourami (*Trichogaster leerii*), and 54 years later I still keep and breed pearls.
Errol Gear

Freshwater angels—it was over 40 years ago, and I still keep them and breed them. I can remember the excitement when black angels came on the scene!
Shawn Carlson

TFH Facebook Poll

What type of chemical filtration do you use on your tanks?



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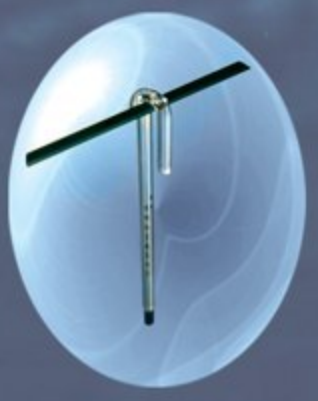

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john robertson

In This Issue: Characins are one of the most popular groups in the hobby, with tetras finding homes in most beginner tanks all the way through Nature Aquariums. One author chose to write about one of the less common characins out there. "The morpho characin is one of the most beautiful, fascinating, and challenging fish I have ever kept and, as it is rarely bred, I thought I had a responsibility to share my experiences."

Other Works: Articles for British magazines and hobby groups.

Best Piece of Advice: "My dad was a good fishkeeper before me, and the advice he gave me as a boy was that you needed three things to excel at fishkeeping: water changes, water changes, and water changes! I usually repeat that story when I am giving advice to beginners."

michael grossman

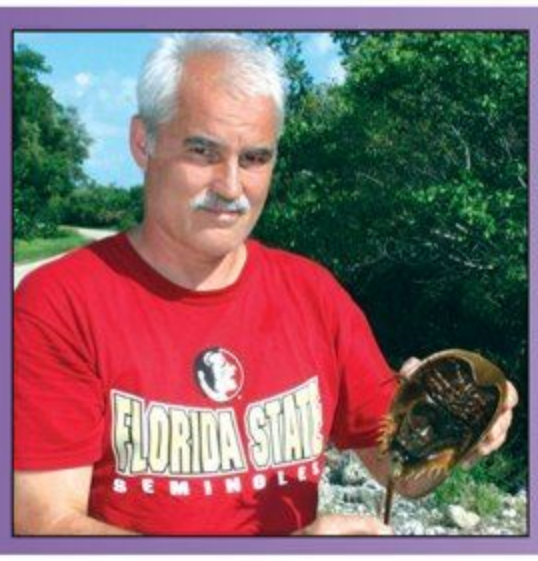
In This Issue: "I wanted to contribute something fun almost anybody can horse around with on a Saturday afternoon."

Why Aquatic Gardening? "One great pet store had a few ponds full of plants out behind the shop. There were lilies, papyrus, lotuses, rubber-banded bunches of anacharis and cabomba, parrot feather, and more plants I don't remember. A flock of guppies swam like snorkeling tourists in floating reefs of hornwort. Even though the whole thing was unshaded in blazing-hot 90°F sun and surrounded by metal fence, there was a stillness there that often made my Saturday afternoon. This is what I like about aquatic plants."

tobias lim koon li

In This Issue: "I decided to write about my history in the aquarium hobby because I felt that I've been blessed with life-changing experiences over the past 12 years of keeping large fish. It was a hobby that truly captured my heart. It became an obsession that I was pleased to share with fellow fish hobbyists through magazines and videos on YouTube. It is also the perfect illustration of how a small hobby can grow into something worth sharing with the rest of the world."

Advice for Predatory Fishkeepers: "My greatest piece of advice to offer someone interested in keeping large predatory fish is to do your research. Never completely trust a salesman trying to make a quick buck out of a purchase that could ruin a life. The most important thing about large predatory fish is to provide large enclosures similar to what most public aquariums and zoos offer. Aside from that, also show the care, commitment, and passion it will take to raise one of these magnificent beasts for many years to come (which usually takes over 20 years)."



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In This Issue: "As a hobbyist for many years, I keep shrimp, crabs, and crayfish both separately and together with fish. Some species I even collect myself in foreign countries. Just a few years ago a lot of new shellfish—not just shrimp but crabs too—came to Europe. They were largely not yet described scientifically, and not much information about their biology could be found. It was very interesting for me to find out how they could best be kept in tanks and how they mate. Since there was little information, I decided to share my experiences with the public."

Other Works: Five books on aqua terrariums and many articles.

Why Keep Crabs? "The tiny new crabs are very nice critters; some are very colorful and, because of their small size, do not require too much room. There is always a place in your fishroom to keep some of these. Most *Geosesarma* spp. have interesting social biology and are highly developed, meaning they bear only a few large, well-developed offspring. To find out details of their biology and mating behavior is very interesting, especially when it is done before some species might disappear."

also in this issue: Takashi Amano, Jack Wattley, Eric Hanneman, Charles Clapsaddle, Mark Callahan, James Fatherree, Mike Hellweg, Lea Maddocks, Richard Aspinall, Valerio Zupo

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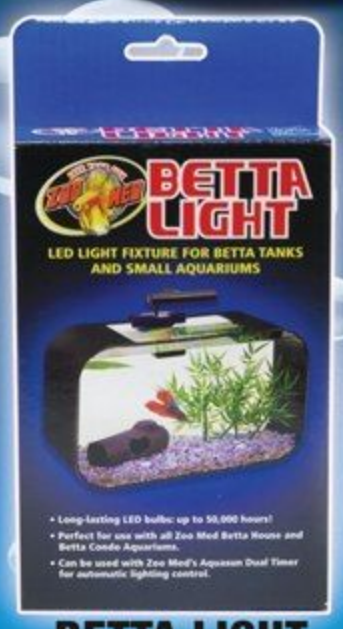

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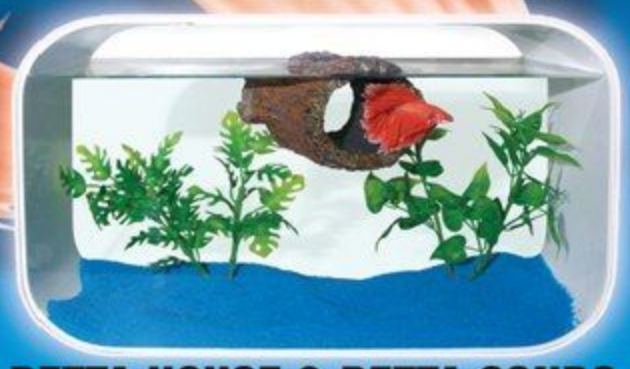

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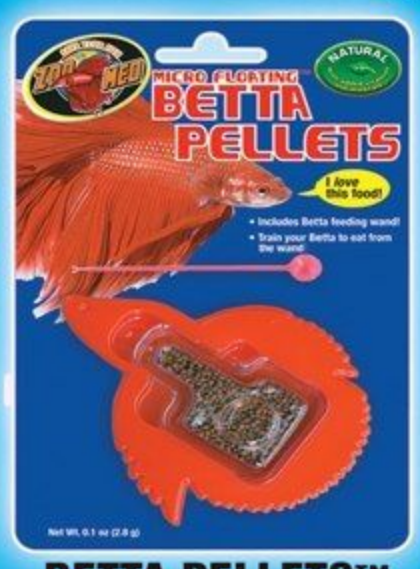

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Monster-Sized Filtration

Tobias Lim Koon Li's pond is an example of the proper way to keep predatory fish. At 13,000 gallons, there is plenty of room for the brutes to swim and stay out of each other's way. A critical component of the pond is having a filtration system up to the challenge. Visit the Aquatic Videos blog to check out Tobias' system that he developed specifically for the pond, as well as the various other setups he has in his home.

Tobias Lim Koon Li

Clownfishes and Other Damselfishes

Damselfish are among the most common and popular marine fish available, and it's little wonder why—they are outgoing, colorful, and full of personality. But before you end up with a holy terror in your tank, you must learn what damsels are right for you. Check out the Book Excerpt blog for a preview of Jeff Kurtz's book *Clownfishes and other Damselfishes.*

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More from Interzoo

Interzoo is one of the greatest places to see the newest aquatic products and observe trends in the hobby, as Valerio Zupo reports on p. 98. Do you want to see more of this incredible show? Check out the Aquatic Videos blog for a video featuring the Interzoo Experience. This is the next best thing to being there and seeing it for yourself.

Valerio Zupo

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Tiger Barbs

The ever-popular tiger barb (*Puntius tetrazona*) is a staple of the aquarium hobby, but it tends to get a bad rap for being an aggressive fin nipper in the community aquarium. If kept singly or with just a few individuals, it can certainly live up to its reputation. But when kept in large groups of six or more individuals in large tanks, tiger barbs are likely to leave other species alone and focus solely on their own hierarchy.

Besides the requirement to keep them in a school, they are not difficult to maintain in the aquarium. They are omnivorous and will accept pretty much any appropriately sized aquarium fare. As active fish, tiger barbs should be given plenty of open space for swimming. They are not known to damage live plants and can really pop against the green background of a lushly planted tank.

Q&A freshwater

Q Bristlenose or Oto for Algae Control?

I have a freshwater aquarium containing a school of bleeding heart tetras. Lately, a film of green algae has begun coating the glass, gravel, and decorations, so I'm considering adding either a bristlenose pleco or oto catfish to help control the algae. Do you have an opinion on which would be a better choice for algae control in my 29-gallon tank? I'm leaning toward an oto because I know plecos can get pretty big.

Victoria Davidson
via email

A *If I were you, I would probably lean in just the opposite direction. Both the bristlenose catfishes* (Ancistrus *spp.) and the oto catfishes* (Otocinclus *spp.) are pretty good algae eaters. However, the bristlenose* Ancistrus *catfishes tend to be much more reliably hardy than* Otocinclus *catfishes are. Plus, otos favor cooler water conditions than your bleeding heart tetras (Hyphessobrycon erythrostigma) do—another selling point for the bristlenose cats, which thrive at normal tropical temperatures and aren't especially fussy with respect to water chemistry. Also, there's really no need to worry that a bristlenose catfish will outgrow your 29-gallon (though I tip my hat to you for considering this). Some of the loricariid species sold as "plecos" can get prohibitively large, but the bristlenose catfishes—despite being occasionally labeled as plecos—stay within the very manageable 4- to 6-inch range.*

Q Several Newcomers Better Than One?

When adding new fish to an established aquarium, would it make more sense to introduce them several at a time rather than one at a time? It seems to me that several newcomers arriving all at once would be less likely to get picked on by the resident fish than a single new arrival would. Does this seem like sound reasoning to you?

Dan Antoszewski
via email

A *Your reasoning certainly is sound in my opinion. Adding more than one new fish at a time to a system where the locals have already established a hierarchy can help to minimize the likelihood of one newcomer getting singled out for bullying. I would add a few caveats, however. If the bioload in your aquarium is already pushing maximum, your biofilter might not be able to accommodate more than one new arrival. Also, you have to factor in the relative aggression levels of the established fish and the newcomers. It's always best to introduce fish to an aquarium in the order of least aggressive to most aggressive. Adding a shy, peaceful species to an aquarium already stocked with rough-and-tumble species is asking for trouble no matter how many specimens you introduce. In that case, you'd just be serving up more victims for the bullies.*

got a question?

Send your questions about the freshwater side of the aquarium hobby to "Q&A," T.F.H. Publications, P.O. Box 427, Neptune, NJ 07754, or submit via e-mail to editor@tfh.com. For answers to more time-sensitive questions, opinions on your setup, or just to converse with like-minded members of the aquarium community, please visit the *TFH* Forum at forums.tfhmagazine.com.

Q Dwarf Rasbora Questions

I received a 10-gallon aquarium as a gift for my birthday, and I'm looking for a small species to stock it with. One possibility is the dwarf rasbora (*Boraras maculatus*). Assuming that's a good choice, can you give me any advice on how to keep it properly?

Rod Empey
Salem, Oregon

A *I'd say* B. maculatus *would be a good choice for your 10-gallon. At only about an inch in maximum length, it certainly stays small enough for a tank that size.* B. maculatus *does best in a single-species aquarium or with other very small, peaceful species and should be kept in groups of at least 8 to 10. The preferred water chemistry for this species is soft (5 to 12 dH) and acidic (5.0 to 6.0 pH), and the water temperature should fall somewhere in the mid to upper 70s Fahrenheit. The tank should be densely planted so this timid fish feels protected, and it's a good idea to employ floating plants to reduce light penetration, as subdued illumination is best. In nature,* B. maculatus *consumes very tiny prey items, so examples of good choices for aquarium feeding include daphnia, newly hatched brine shrimp, cyclops, crushed flakes, and micropellets.*

Torsten Dietrich/Shutterstock

■ Bristlenose plecos are hardy fish that do well in tropical temperatures and aren't overly fussy when it comes to water parameters.

MP. & C. Piednoir

■ Dwarf rasboras (*Boraras maculatus*) are small fish that do well in densely planted nano tanks.

Q Freshwater Fish, Marine Décor

I love the appearance of saltwater aquariums, but I'm new to the aquarium hobby and not quite ready to take the plunge into keeping saltwater fish. Is there any reason I can't set up a tank that is decorated to look like a coral reef but is stocked with freshwater fish? Would that be too strange aesthetically speaking?

Dana Carpenter
Phoenix, Arizona

A *Well, strange is largely in the eye of the beholder when it comes to aquarium décor. With judicious selection of aquascaping materials, you could certainly create an aquarium that is visually reminiscent of a marine reef aquarium but perfectly suitable for freshwater fish. I would place special emphasis on "judicious selection of aquascaping materials," however, because some of the materials commonly used in saltwater systems could cause certain water-chemistry problems, depending on the freshwater species you plan to keep. For example, the calcareous rocks and substrates marine aquarists tend to use would tend to raise the hardness and pH of the water too high for freshwater species that naturally occur in water that leans to the soft and acidic.*

A good way to get around that potential issue is to utilize artificial corals and live rock, which are totally inert, so they won't impact water chemistry, and arguably quite convincingly rendered nowadays. You could, perhaps, utilize those along with a small-grained white gravel to create the impression of a coral reef and the surrounding sand.

If you're a purist and prefer to work with natural calcareous rocks and sand, you can still keep freshwater fish in your setup. You'll just have to limit your livestock selections to species that thrive in hard, alkaline conditions—for example, mollies and other livebearers and the various African Rift Lake cichlids.

Q Water Chemistry Question

I read the Q&A column regularly, and I've noticed you frequently state that many aquarium fish have adjusted to a broad range of water chemistry values, so hobbyists

Marcelo Saavedra/Shutterstock

■ Despite its common name, "Chinese algae eater," *Gyrinocheilus aymonieri* feeds on the protective slime coating of other fish as an adult and is therefore an inappropriate tankmate for other fish.

don't need to be overly concerned about parameters such as pH and hardness—but then you proceed to list the desired values anyway. I don't mean to be critical, but why give this information if it isn't important?

Stephanie Hammond
via email

A *Well, I hope I haven't created the impression that water parameters such as pH and hardness aren't important. The only point I've tried to make is that fish that have been bred in captivity for many years tend to be more adaptable with respect to water chemistry than their wild counterparts, so hobbyists who are keeping captive-bred specimens of these species don't necessarily need to worry if their water chemistry falls outside the values that prevail in the species' natural range. Nonetheless, I think it's still helpful to have this information because, despite being adaptable, even species that have been bred for years in captivity tend to thrive best, display their best colors, and breed more successfully in water conditions that are as close to natural as possible. Also, it's important to note that many freshwater fish in the aquarium trade have not been successfully bred in captivity, so wild stocks remain the only source for them. In these cases, knowing the water chemistry and temperature values of the species' natural range can be critical.*

Q Chinese Algae Eater a Cleaner?

I have a Chinese algae eater that's starting to show some unusual behavior. It actually attaches itself to my gold severum and cleans its body. Have you ever heard of this species doing this before, or do I just have a weird specimen?

Kent Armani
via email

A *I have heard of the Chinese algae eater (assuming the species in question is* Gyrinocheilus aymonieri*) attaching itself to other fish, but it's not doing this for the reason you might think. What you're observing isn't an example of mutualistic symbiosis akin to the relationship between marine* Labroides *spp. cleaner wrasses and the client fishes that present themselves to be cleaned by them. Rather, your* G. aymonieri *specimen is feeding on the severum's protective slime coating, which will leave it vulnerable to infection and can ultimately lead to its demise. I'm afraid that, for the health of your severum, you really should find a new home for the Chinese algae eater.*

Q Subtropical Fish Defined

Hello, *TFH*! I'm a 14-year-old aquarium hobbyist. Can you tell me what a subtropical fish is? I wanted to buy some white cloud mountain minnows for my community tank, but the person at the pet store told me that they're subtropical fish and shouldn't be kept with tropical fish like the ones in my tank.

Scott Bonson
Middletown, Ohio

A *As you probably know, Scott, many of the fish available in the aquarium hobby come from tropical regions where the climate is warm and humid year round. By contrast, the climate here in Ohio, where you and I both live, is temperate, which means we have relatively warm summers and cold winters with spring and autumn temperatures falling somewhere in between. (Of course, your winters down there in the southern part of the state are a bit milder than they are up here in northwest Ohio where I live—but that's neither here nor there.) Subtropical regions—such as the area in southern China where white cloud mountain minnows* (Tanichthys albonubes) *were originally discovered—sort of split the difference between tropical and temperate climates. The subtropics do tend to be very warm for much of the year, but there is also some cooling during the winter months—just not to the extent that folks from temperate zones are accustomed to.*

What's neat about white cloud mountain minnows and many other subtropical species is that, in addition to being really cool (as in neat) fish, they also tend to be more hardy and adaptable than many of the tropical

species. They will thrive when kept at average room temperature or even slightly cooler, so it's not usually necessary to use an aquarium heater for these fishes. In fact, they look much better and live much longer when kept at these slightly cooler temperatures—which is why the dealer at your local pet store rightly discouraged putting white cloud mountain minnows in your tropical tank.

Q Zebra Loach Endangered?

Is it true that the zebra loach is endangered in the wild? If so, do you know why?

Larry Stopera
Auburn Hills, Michigan

A Assuming you're referring to Botia striata, *it is true that this species, which is endemic to the Western Ghats mountain range of Maharashtra, India, is classified as endangered on the IUCN (International Union for Conservation of Nature and Natural Resources) Red List. According to the IUCN website,* B. striata's *endangered status stems primarily from habitat alteration. This species is found in only a handful of fragmented*

Aaron Norman

■ Though common in the aquarium hobby, the zebra loach (*Botia striata*) is endangered in the wild largely due to habitat destruction.

locations in clear mountain streams that have bottoms consisting of sand or pebbles and gravel. However, as a result of deforestation and subsequent siltation, these characteristics are being altered significantly to the detriment of these bottom-dwelling loaches. The website also identifies "recreational activities on the mountain tops and pollution of the hill streams" as contributing to the problem.

Q Vacuuming Depth

When I vacuum the substrate in my freshwater aquarium, should I clean just the surface or all the way down to the glass bottom of the tank? I don't have any live plants rooted in the substrate, so that's not a concern.

Paige Siebold
via email

A The appropriate vacuuming depth depends on the type of substrate you have. If it's a gravel substrate, you'll need, at least occasionally, to vacuum all the way down to the glass bottom because detritus has a tendency to work its way down through larger-grained substrates. To avoid disrupting your biological filter, it's a good idea to tackle this chore over the course of several water changes, perhaps vacuuming only a quarter or third of the bed each time, rather than all at once.

Mark Smith

■ The peacock spiny eel (*Macrognathus siamensis*) should be given an aquarium with sand or other soft substrate so it doesn't get hurt when burrowing.

With a fine-grained substrate, such as sand, detritus tends to accumulate on the surface rather than settling down through the substrate. That's a good thing, too, because if you try to vacuum a sand substrate the same way you would gravel, you'll end up sucking a lot of sand right out of the tank.

To remove detritus collected on top of the sand, position the vacuum a few inches above the surface and gently wave it back and forth. This action will create just enough turbulence to lift the detritus off the surface so you can capture it with the vacuum without sucking up much sand. Another option is to gently stir the surface of the sand to liberate detritus into the water column just before vacuuming. I've found that one really convenient way to do this is to attach a wooden or plastic dowel or rod of some kind to your vacuum tube with rubber bands or plastic zip strips so that the rod extends a few inches beyond the end of the tube. This arrangement will allow you to stir the sand surface while simultaneously vacuuming up floating debris using only one hand.

Q Sore on Peacock Spiny Eel

My peacock spiny eel has a scrape or sore on its underside, and I'm trying to figure out what caused it. My ammonia and nitrite check out at zero, and nitrate is between 10 and 20 ppm, so I don't think it's related to water quality, and I haven't seen any of the other fish picking on it. I tried to get a photo of the injury so you can see what I'm talking about, but the eel won't hold still long enough for me to get a clear shot. One thing that definitely sticks out in my mind is that the eel no longer buries itself in the gravel like

Horst Linke

■ The imitator cory (*Corydoras imitator*) has a longer snout than the fish it's said to be imitating, *C. adolfoi*.

it used to. Now it tends to rest on a bunch of java moss. Any thoughts on what's going on here?

Paul Taylor
Pontiac, Michigan

A *I think you might be on to something with your observation that the eel no longer buries itself. The peacock spiny eel (presumably* Macrognathus siamensis*) and its close relatives are burrowers and are commonly seen almost completely buried in the substrate with only their heads emerging. Hence, in aquarium systems, they really should be provided a fine, soft substrate material, ideally sand. When they attempt to burrow in gravel—unless it's very fine and smooth-edged—they are prone to abrading their sensitive skin, which can produce sores that leave them vulnerable to infection. At this point, you may need to very gradually change your substrate, one small section at a time to prevent disrupting your biological filter too greatly, to a softer material. If the spiny eel seems to have a preferred burrowing spot, I would suggest changing out that area first to reduce the likelihood that it will continue to abrade itself. In the meantime, continue to maintain exceptional water quality to promote healing and, hopefully, prevent infection.*

Q Imitator Cory

My local fish store is selling a species of *Corydoras* catfish called the imitator cory. What exactly is this fish supposed to be imitating? I asked the dealer, and he said he thinks it mimics another cory species. Is that accurate?

Richard Vasquez
via email

M.P. & C. Piednoir

■ An assortment of variables ranging from activity levels to eating methods are involved with determining a species' ideal feeding frequency.

Common names that include terms like "imitator," "mimic," "true," or "false" always strike me as a bit odd. After all, who's to say who's imitating whom? And what makes one species "true" while another very similar species is "false"? Now, I understand that the order in which similar species are discovered and classified plays a big role in this regard. Still, such designations seem particularly arbitrary to me. I guess it's just one more good reason to rely on scientific names rather than common names!

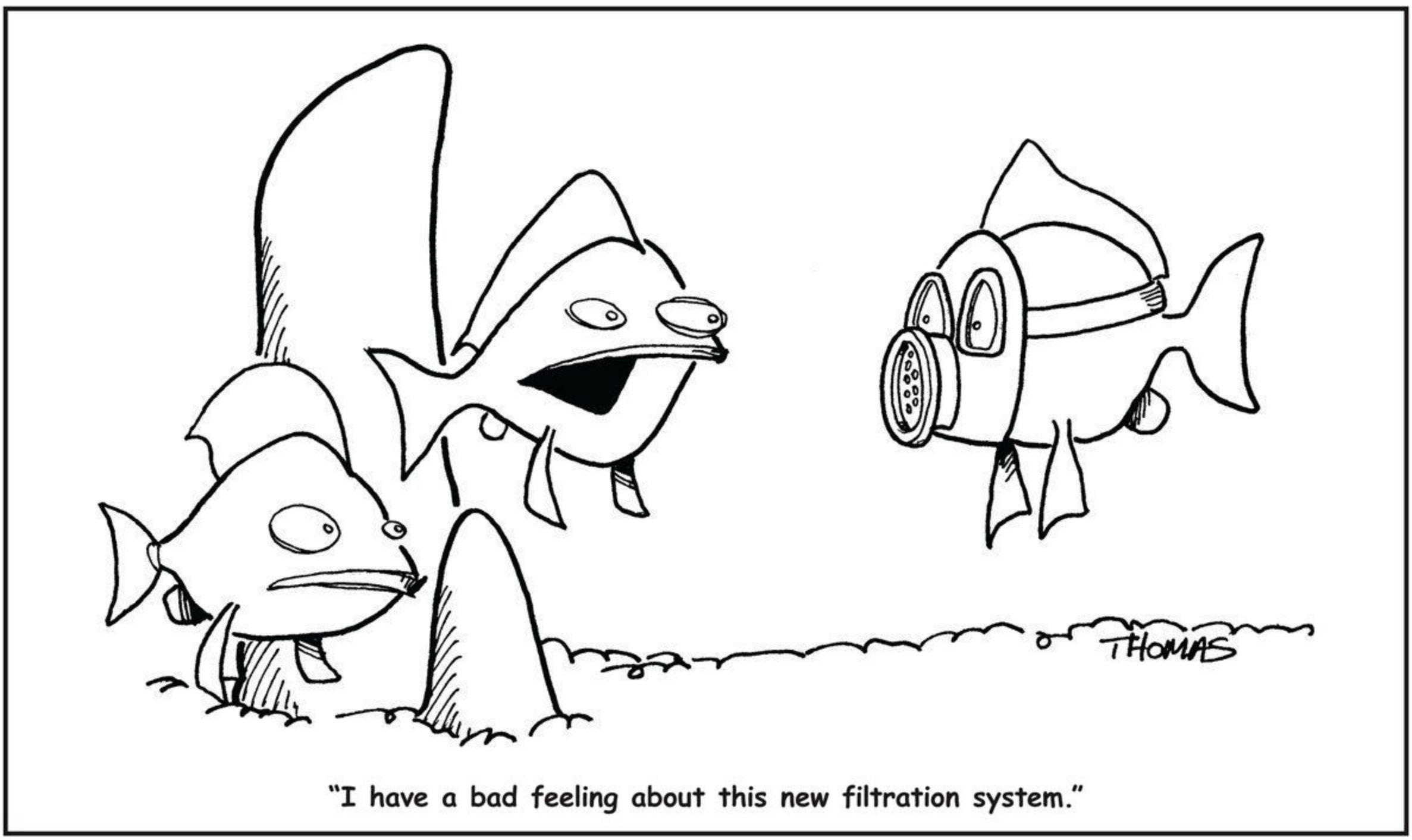
Q Feeding Frequency

How exactly do you ascertain how frequently a species of fish should be fed? There are a lot of sweeping generalizations out there, but it seems to me that different fish species will have very different needs in this regard.

Julie McGraw
via email

A *As I understand it, the imitator cory, which I'm assuming to be* Corydoras imitator, *is so named because it is very similar in appearance to* C. adolfoi, *both of which are found in South America's Negro River Basin. These two species have almost identical raccoon masks over their eyes and dark shading along their dorsal surface. However,* C. imitator *can be distinguished from* C. adolfoi *by its longer snout.*

A *You're absolutely right that the appropriate frequency of feeding—as with the types of food that should be offered—can vary significantly from one species of*



"I have a bad feeling about this new filtration system."

fish to the next. Of course, researching the characteristics of the species in question should be your first step, but I fully understand that authoritative information isn't always plentiful on every species.

Oftentimes, understanding what and how the species eats can help determine the correct frequency. For example, an herbivorous or omnivorous species that tends to nibble on tiny crustaceans and/or graze on vegetable matter throughout the day will obviously benefit from multiple small, daily feedings or even a constant supply of some type of graze-able food, such as dried algae. On the other hand, a predaceous species that hunts by ambush—and, therefore, may be naturally accustomed to periods of "feast and famine"—may do better with larger feedings spaced farther apart, perhaps even separated by several days.

The activity level of the fish provides some helpful insight, as well. Hyperactive species that seem to be perpetually in motion will tend to require more frequent feedings to fuel their metabolism than sedentary bottom dwellers might.

As you've noted, sweeping generalizations aren't really useful in determining how often fish should be fed. But with a little homework and inquiry, you should be able to figure out a regimen that makes sense for the species in your care.

Q Water Change System

I just ordered one of those gravel vacuum/water change systems that hook up directly to your sink faucet, so I can stop lugging buckets of water from room to room (I have a total of eight aquariums in various locations around my house). However, a rather important question has occurred to me. How do you go about dechlorinating the tap water, since it flows right from the tap into the tank? Do you just add it right after you've refilled the tank? Will that short period of exposure to chlorine be harmful to the fish?

Paul Ritter
Wichita, Kansas

A *Most people who use the type of water change system you describe either add tap water conditioner immediately before refilling the tank, or as they're refilling the tank. Some even split it up—adding half of the conditioner just before refilling, and the other half while refilling. I would tend to favor one of these approaches rather than waiting until the tank has been completely refilled simply because the flow of the tap water will help to mix the conditioner and water. No harm should come to your fish from being exposed to untreated tap water for this very brief period.*

Q Cracked Aquarium Pane

I just recently inherited a used 29-gallon tank from a friend. I was really excited because I'd been thinking about getting back into the hobby for some time, and this tank gave me the perfect excuse. Unfortunately, while trying to lift it out of my trunk, I lost my grip, and the tank slid down onto the trunk latch. Needless to say, there is now a 2-inch crack in one of the side panes. Would it be safe to repair the crack with silicone, or would it be better to replace the entire pane?

Brian Measley
via email

A *If I were in your shoes (and I have been, on one or two occasions), I would replace the tank completely rather than attempt to repair it. In my humble opinion, trying to fix a cracked aquarium is just begging for trouble. Simply filling in the crack with silicone won't restore the pane's structural integrity, so you're still probably looking at a leak—if not a catastrophic failure—down the road. Replacing the entire pane, on the other hand, is very labor intensive, and you really have to remove and replace all of the silicone inside the tank because the new silicone won't adhere properly to the existing material. Either way, the odds aren't great that you'll end up with a structurally sound, leak-free aquarium when all is said and done.*

As I see it, choosing whether to repair or replace a damaged aquarium comes down to a simple cost analysis—i.e., the cost of buying a new tank versus the cost of repairing the damage done after it dumps all of its contents onto your floor (which would likely not be covered by insurance). For the very modest price of most new aquariums, I just don't think the risk is worth it.

Q Swordtail and Platy Reproduced?

I have a male red velvet swordtail and five female pineapple platies in a 30-gallon tank. Today, I discovered a group of fry hiding in a corner of the tank behind an artificial plant. I've heard that female platies can store sperm for a long period of time, so I'm assuming one of the females must have mated with a male platy before I bought her. That's the only explanation I can come up with. On the other hand, the fry look a lot like the male swordtail in color. Can swordtails and platies breed with one another?

Christopher Reece
via email

A *Either circumstance is a possible explanation for the appearance of fry in your tank. As you mention, it could be that one of the female platies had stored sperm from a previous mating with a male platy—perhaps one that is similar to your male swordtail in color. On the other hand, swordtails and platies, which belong to the genus* Xiphophorus, *will readily hybridize with one another, so it could also be that the male swordtail sired the fry. In fact, the distinction between swordtails and platies has become largely blurred in the hobby, owing to the rampant hybridization, intentional or otherwise, of the various* Xiphophorus *species to create different cultivated forms. "Genetically pure" specimens of wild green swordtails* (X. hellerii), *southern platyfish* (X. maculatus), *and the variatus platy* (X. variatus)*—the species that have been mixed and mingled to create today's incredible diversity of swordtail and platy strains—are rarely available in the hobby.*

Q&A saltwater

got a question?

Send your questions about the saltwater side of the aquarium hobby to "Q&A," T.F.H. Publications, P.O. Box 427, Neptune, NJ 07754, or submit via e-mail to editor@tfh.com. For answers to more time-sensitive questions, opinions on your setup, or just to converse with like-minded members of the aquarium community, please visit the *TFH* Forum at forums.tfhmagazine.com.

Q Firefish Skittish at Mealtimes

I have a 30-gallon saltwater aquarium that contains a purple firefish, a Randall's shrimp goby, a purple dottyback, and various zoanthid and mushroom polyp colonies. My question is about the firefish. It had been eating well for months after I got it, but lately whenever I feed the tank, it hides in the rocks and misses out on all the food. I'm afraid it's going to starve if this continues. Why does it hide only at mealtimes?

Marty Fiedler
via email

A *Assuming your purple firefish is* Nemateleotris decora, *it is a highly skittish species that is prone to staying in hiding when more aggressive species are present. In your situation, I wouldn't be surprised in the least if the purple dottyback (presumably* Pictichromis porphyrea*) is bullying the firefish. Based on my experience in keeping this species,* P. porphyrea *can be relentlessly belligerent toward tankmates, particularly those that are similar in size, color, or the niche they occupy on in the tank. Even if the dottyback leaves the firefish alone most of the time, it may still get its hackles up and assert its highly competitive nature at feeding times. That might be why the firefish goes into hiding whenever food is introduced. Truth be told, these two species aren't really compatible, especially in smaller aquariums. More than likely, you're going to need to find alternate housing for one or the other very soon.*

Q Refugium Filter

Can you explain to me what a refugium filter is? On a recent episode of Animal Planet's *Tanked*, this term was brought up, but I'm not familiar with this type of filter.

Douglas Astley
Mobile, Alabama

A *Essentially, a refugium is nothing more than a separate tank, often with multiple compartments, that is plumbed to a display aquarium so that both share the same system water. A refugium can serve a variety of purposes, the most basic being the provision of a safe place—or refuge—to isolate organisms that are, for example, being bullied, at risk of being preyed upon, or somehow causing problems for other livestock in the display tank.*

As you learned from watching Tanked, *a refugium can also be used to provide various forms of filtration. For example, it's a good place to put additional live rock and/or live sand for the purpose of biological filtration as well as a place to grow macroalgae (under appropriate lighting) for the purpose of nutrient export. When containing live rock, live sand, and/or macroalgae, a refugium can also promote the proliferation of numerous tiny beneficial organisms, such as amphipods and copepods, that can serve as fish and coral food when swept into the display tank. Also, a refugium is a convenient place to put a protein skimmer, heater, or other equipment that the hobbyist would prefer to keep hidden for the sake of aesthetics. So, as you can see, a refugium is a very versatile aquarium system component.*

Q Cleaning Live Rock

I'm expecting a shipment of cured live rocks for my newly set up 55-gallon reef tank. Do I need to somehow clean the rocks before putting them in my tank?

Joanne Lee
Hialeah, Florida

With cured live rocks, there's typically not a lot of cleaning required. Perhaps the best way to describe the process is selective cleaning. Whenever I receive a shipment, the first thing I do is take each rock out of the box and give it a good rinse in clean salt water, which I've mixed ahead of time in a 5-gallon bucket or plastic bin, in order to liberate any loose debris or detritus clinging to the rock. Then, I look it over carefully for obviously dead encrusting organisms or suspect slimy patches. These I brush off with a clean (never used for any other purpose) scrub brush or toothbrush before rinsing the rock again in the salt water. However, I never scrub the entire surface of the rock—just the portions of it that contain decaying organic matter (if there is any). Oftentimes, all that's needed is a good rinse to clean cured live rocks. Remember, your goal is to keep alive as many of the encrusting organisms as possible. They're what you paid for, after all. Also, keep in mind that a certain degree of additional die-off on the live rock is actually desirable when you're starting a new saltwater aquarium because it will provide an ammonia source to initiate the cycling process.

Iliuta Goean/Shutterstock

A skittish fish in the best of circumstances, the purple firefish (*Nemateleotris decora*) is especially prone to go into hiding when more aggressive species are present.

Melissaf84/Shutterstock

Keeping squarespot anthias (*Pseudanthias pleurotaenia*) in groups will require a very large tank, and only one male should be kept with several females.

Q Stocking Squarespot Anthias

Does the squarespot anthias have to be kept in groups or can you keep individual specimens? If I do decide to keep a group, could I do so in a 125-gallon tank? The fish in there now include one royal gramma, one kole tang, one Rainford's goby, and five bluestreak cardinalfish.

Steve Sachs
Seattle, Washington

That's a neat lineup of fishes you've got there! The squarespot anthias (Pseudanthias pleurotaenia) *can be kept singly with no problem. It is possible to maintain a group of this species, provided you keep them harem style at a ratio of one male to at least five or six females (the females lack the pink square-shaped spot that gives this species its common name) and in a very large aquarium to minimize the intensity of hierarchical squabbling. However, owing to the aforementioned hierarchical squabbling, success with keeping anthias in groups is often elusive and is by no means assured just because the gender ratio of the specimens and the size of the aquarium are appropriate. In any case, I would definitely consider your 125-gallon to be on the small side for keeping a group of* P. pleurotaenia. *Something in the range of a few hundred gallons with lots of live rock structure for hiding would be about the bare minimum in my opinion—and even then, I wouldn't give any guarantees. It might be best to avoid tempting fate by keeping only one specimen.*

Q Frag Racks

I've had a 60-gallon stony coral reef tank up and running for a few years, and I've seen a lot of good growth in my corals, especially my acros, since I set up the tank. Now, I need to frag several of the corals to keep them in control. My plan is to set up a separate, small aquarium for keeping and growing out these frags. Whenever I see photos of frag tanks, they have some sort of stair-step

M. Uptegrove/Shutterstock

■ Like many species of corals, torch corals will benefit from direct feeding a few times per week.

rack in them. Is that something you can buy or are these racks usually homemade? I'm on a tight budget, so cost is definitely a concern.

Zack Hunter
Birmingham, Alabama

A *Actually, you can acquire a frag rack either way. Commercial manufacturers offer them in a variety of styles, including the stair-step configuration you mention. I've also seen various racks and shelves that are designed to be mounted right inside the display tank, using suction cups or magnets, in case you have a smaller number of frags or don't want to fool around with setting up a separate aquarium. Homemade frag racks and shelves are common, as well. Acrylic and eggcrate (joined together with aquarium-safe adhesives like epoxy or super glue or even with plastic tie wraps) are very common materials used for homemade racks. Just do a quick search online using the keywords "DIY frag rack" (or some variation upon that) and you should bring up all kinds of designs that are easy and inexpensive to make right at home—even for a butterfingers like me!*

Q Torch Coral Feeding

I just purchased a torch coral for my reef tank, but I don't know anything about its nutritional requirements. Do I need to feed this thing or will it be okay with just the lights?

Aton Carrington
via email

A *First, I would be remiss if I didn't point out that it's critical to research the needs of any organism before purchasing it for your aquarium. That way, it's much less likely that the creature will end up in an inappropriate environment and you won't have to worry as much about unpleasant surprises. While it does harbor zooxanthellae in its tissues and, hence, derives much of its nutrition from the photosynthesis carried out by these symbiotic algae, your torch coral (most likely* Euphyllia glabrescens*) will definitely benefit from supplemental (once or twice weekly) direct feeding. Fortunately, appropriate foods are not difficult to provide for this species. Items like mysis shrimp and chopped fish, mollusk, and crustacean flesh are good choices. These foods should be delivered directly to the tentacles using a turkey baster or pipette. It may be necessary to shut off all sources of water movement while you're doing this so the food isn't swept away before the tentacles can seize it.*

Q Hippo Tang Hunger Strike

Two days ago, I bought a hippo tang for my FOWLR (fish-only-with-live-rock) tank, and, as you always recommend in the Q&A column, I made sure it was eating at the pet store before I committed to the purchase. However, now that I've got it at home in a quarantine tank, I can't get it to eat anything. It was accepting mysis shrimp at the store (I know because I watched it eat), but now it doesn't seem to recognize the shrimp as food. Why did it stop eating, and what do you recommend that I do at this point?

Monica Overton
Milwaukee, Wisconsin

A *Assuming your water parameters are all in line and you aren't observing any outward signs of disease in the fish—such as*

scraping against objects in the tank, rapid breathing, white spots or a velvety coating on the body or fins, etc.—you can probably rest assured that there's no cause for concern right now. If the hippo tang (Paracanthurus hepatus) *is otherwise healthy, going two days without eating is no problem whatsoever. If you'd said it hadn't eaten in two weeks, I might be a bit more concerned—but still not panicked. The fact that the specimen was eating at the pet store is a good sign because it means that it can be induced to accept standard aquarium fare and very likely will do so again.*

The current hunger strike is probably just a response to the stress of being transferred suddenly to a new environment. Give it a little time to settle into its new home and get accustomed to the different stimuli around it, and it should soon find its appetite again.

At this point, try to keep things calm around the tank and keep offering a variety of different foods in very small amounts—maybe once or twice a day—until something triggers a feeding response. If it refuses to eat what's offered, net

Iliuta Goean/Shutterstock

While hippo tangs (*Paracanthurus hepatus*) may refuse to eat right after being introduced to a new environment, they should come around in time.

out the uneaten food and try again later in the day or the following day. Don't push too hard by constantly dropping in different foods or you'll just stress the fish all the more and foul the water in the process.

Once it resumes feeding—which (again, barring disease or water-chemistry issues) I'm fairly confident it will—your tang may take only one type of food initially. But don't settle for that. You'll want to continue to rotate offerings so it learns to accept a variety of different foods and develops a diverse palate while it's still in quarantine. That will help prevent any nutritional deficiencies in the specimen down the road.

Q Picasso Trigger Aggressive or Not?

How would you rate the aggressiveness of the Picasso triggerfish? I've read mixed accounts on this. Some people say it's very aggressive, but others say it's one of the more peaceful triggers. Who's right?

Miles Fox
Corpus Christi, Texas

A *With many of the triggerfish species, reports on their relative aggressiveness will differ considerably because, as they say in those commercial disclaimers, "individual results may vary." In other words, there can be a lot variation among individual specimens of a given species—not just among different species—when it comes to aggressiveness. Also, just because a specimen behaves itself upon initial introduction or while it's young and small doesn't necessarily mean it won't get more feisty as it ages and increases in size. I*

Ed Wong

■ Although not as aggressive as many other trigger species, the Picasso triggerfish (*Rhinecanthus aculeatus*) can still behave quite belligerently in an aquarium.

think one could safely say that, on average, Picasso triggerfish (Rhinecanthus aculeatus) *tend to be much less belligerent than some of the more notoriously aggressive trigger species, for example,* Balistapus undulatus. *But individuals of even reputedly peaceful species have been known to pull the proverbial "Jekyll and Hyde" and suddenly turn on their tankmates or even bite the hand that feeds them. When it comes to triggerfishes, "trust but verify" is probably the best philosophy for hobbyists to live by.*

Q What's the Problem with Parrotfish?

As an avid scuba diver who is especially fond of parrotfishes, I'd love to set up a large aquarium for one (or more). But when discussing my plan with my local dealer, she advised against it and told me she won't order them in because they aren't good aquarium candidates. Is that true? What makes them such poor choices for aquariums?

J.C. Selman
via email

A I definitely feel your pain with respect to parrotfishes. I, too, am smitten by them and have fond memories of observing groups of these show-stopping fishes cruising over the reefs while scuba diving. Unfortunately, your dealer is correct that, generally speaking, the parrotfishes make poor aquarium candidates. For one thing, the majority of species get way too large for the average home aquarium and they tend to cruise over large areas when foraging for food. All that robust energy is just too difficult to contain within an aquarium. For another, their diet is very difficult to replicate in a captive setting. In nature, parrotfishes munch up stony coral skeletons and digest the algae and other organisms

Rich Carey/Shutterstock

Parrotfish are largely inappropriate for home aquariums because they require a lot of open space to swim and will feed on coral skeletons.

residing on and within it. That which cannot be digested gets, as you've probably observed while diving, excreted in the form of sand.

The good news is, if you look at the various wrasses, you'll find several species that are not only quite parrotfish-like in shape and coloration but also more suitable for aquarium life in terms of their maximum size and dietary needs. Nonetheless, you still have to be cautious in choosing from the wrasses, as there are plenty of tankbusters and hard-to-feed species among this very large, diverse group of fishes as well.

Q Ich Despite Quarantine

I quarantined a new coral beauty for two weeks, and during that time, I looked it over every day when I fed it for symptoms of ich or other diseases and never saw any. Also, each day, I changed 50 percent of the water to provide optimal conditions. To make a long story short, since I was so confident that the coral beauty wasn't sick, I went ahead and moved it to my display tank. Now, several of my fish, including the coral beauty, are scraping against the rocks and I'm starting to see white spots on them. I assume what I'm seeing is ich. How did I miss this? I thought I was doing everything right!

Wayne Weltin
via email

A *There are a few details in your question that I think are telling here. The first is the duration of your quarantine period. Two weeks is just not enough time to be certain that a newly acquired fish is disease-free. In most cases, I wouldn't quarantine a new specimen for any less than four weeks. Second, you mention that you checked the coral beauty for symptoms every day when you fed it. Feeding time isn't necessarily the best time to observe fish for symptoms of marine ich* (Cryptocaryon irritans). *In the earliest stage of ich, those tell-tale white spots aren't always evident, so you have to keep an eye out for behavioral symptoms that indicate the fish is infected, such as twitching nervously, breathing rapidly, dashing around the tank, or scraping against rocks. However, when the specimen is excited by the prospect of a meal, these types of behaviors are often suspended, at least temporarily, so you might not notice them. It's often necessary to sit and observe the fish for at least several minutes at a time and multiple times throughout the day in order to see these symptoms.*

ask jack

Dear Jack,

For more than four years, I have been raising African cichlids with no problems. I have been able to sell many of the young cichlids to local hobbyists, and now I would like to try my hand with discus. In one of the aquarium shops where I usually spend time on the weekend, they usually carry a fair number of discus. For me to have the same success with discus that I've had with my Africans, I would ask you to please give me a few specifics to help me get started.

Kevin Wing
Laredo, Texas

Dear Kevin,

First, visit several of the aquarium shops in Laredo, and you should be able to quickly tell if the shop is a good discus shop. Do all the fish—not only the discus—look healthy? And are they not being placed in community tanks? Does the level of conversation about discus convince you that the aquarium shopkeeper knows how to maintain discus successfully?

If you plan to use your municipal water for the new discus—which you probably did for the Africans—you should be aware that its conductivity is high. That will probably be okay for at least any discus that are still growing. I would maintain a water temperature of 82° to 84°F. A pH of 6.3 to 6.4 should be fine.

In a separate correspondence, you asked me what the shop could do to improve their aquarium business. The owner of any aquarium shop is always looking for ways to promote more business.

Now, what can you tell the aquarium shop owner that will help him and should score points for you? In very few retail aquarium shops that I know of here in the United States, as well as in Asia and Europe, do they give much tank space to quality discus of all sizes. My suggestion would be the following: Set up two 100-gallon tanks, each with a different color form of adult discus. Also set up four 75-gallon tanks, each with a different color form of discus that are 2½ to 3 inches in size.

The square footage of these six large tanks will generate more action and business than any other tanks of the same footage in the shop.

Dear Jack,

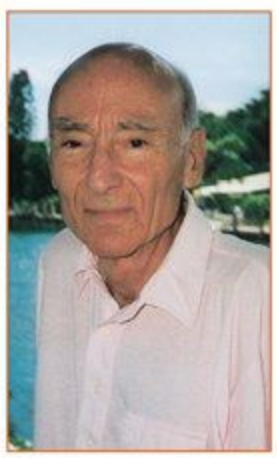
Your name has come up recently regarding the feeding of blood tuna to tropical fish. For that reason, I went to my local supermarket and asked the man in the seafood section if he had any. He didn't have any, and I don't think he really knew what I was asking for. Please tell me where I might find some and if it is worth feeding it to my discus.

Ray Small
Tacoma, Washington

Dear Ray,

Blood tuna—you are in the right area for tuna in any form. I'm very surprised that your supermarket didn't at least know about blood tuna. Drive to your coast, check out one

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

of the wholesale fish operations there, and I believe you will have your answer. However, you won't find any in the supermarkets. The blood tuna sections of the fish are very soft and bloody and not looked upon as being very saleable to the public.

When I was able to obtain some, I wanted to perhaps include it in a discus formula, but a regular supply was not available, so I dropped the idea even though the price wasn't high. I found it to be very unmanageable and soft, so I put some in the microwave, and when it was a bit cooked, I mixed it into some Japanese sea vegetables. The taste of the blood tuna alone wasn't so suitable, but when mixed into the vegetables, it wasn't too bad. But if you do find a good amount, I wouldn't go overboard buying a lot. I don't think it would be worth it.

Dear Jack,

Here in the Chicago area, all the aquarium shops that sell discus seem to carry them in such small sizes that I can't tell what strains they really are. How do I know what I am buying, even though each strain has a name on the aquarium?

Andrea Roig
Cicero, Illinois

Dear Andrea,

What sizes are these fish? Most discus being offered are generally around 3 inches, although most of us have larger sizes available also for sale. All small discus are very easy to counterfeit, more so than other small cichlids, so you have to trust in the integrity of the breeder as well as in the aquarium shop.

Most aquarium shops here in the US, as well as in the European shops I am familiar with, do not breed the discus they offer for sale. These fish can be bred by local breeders as well as by breeders in Asia. And if they are all 3 inches in size, yes, they no doubt will look more or less the same.

If each of the strains you've looked at were in their own tank, it would be possible to distinguish at least some small differences among them all. It's interesting to note that the young fry from their parents can be late bloomers, eventually coloring up later than usual, and I've had pairs produce young that haven't shown any color markings until the age of approximately six weeks.

Dear Jack,

I understand that many of the tropical fish I see in the local aquarium shops are now being bred in Singapore—not only discus, but also tetras, angelfish, and livebearers. A group of us will be at a convention in Malaysia in August, after which I would like to see some of these facilities. Would this be possible?

Jason Knox
Omaha, Nebraska

Gabriel Posada

■ It is much easier to identify the strain of a discus after it reaches a larger size.

Dear Jason,

Singapore is known as "the undisputed ornamental fish capital of the world" and also the top exporter, accounting for more than 25 percent of the world's supply. You will find more than 50 tropical fish farms in Singapore, and I found a number of them were sharing hatchery space—a discus breeding facility in one part and another facility in the same hatchery, breeding tetras by another breeder. All of these fish farms are located in the Agrotechnology Parks.

I found the farms to be exceptionally clean and very professional, and they have for many years been shipping ornamental fish to the US, UK, and all the major European countries. All of these farms are wholesalers and not set up for accepting the tropical fish hobbyist. I have many good friends in Singapore and will ask which farms may greet you, if possible.

However, if the hatcheries are off limits, keep in mind that there are many retail aquarium shops where in a short time you will be able to see not only a number of tropicals not seen in most aquarium shops here in the US but also some of the very best aquarium equipment.

cichlid world

Collecting Cichlids in Panama

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

photographs by the author

Panama, a country that links North and South America, is best known to most people for the Panama Canal. That canal crosses the Isthmus of Panama and links the Atlantic and Pacific Oceans, while at the same time dividing the two continents. Until around 1900, Colombia considered Panama to be part of its territory and it was known by the name Veragua. Other European countries had tried and failed to complete a canal. When the United States decided to give it a try, the terms offered by Colombia were not agreeable, and ultimately Panama became a sovereign nation.

Visiting Panama

Today, Panama is one of the most developed countries in Central America. The highway system has smooth roads, and the currency is the US dollar. English is spoken throughout most of the country, although the official language is Spanish. Panama City is cosmopolitan and has all the amenities of a European or North American city. For these reasons alone, Panama is a good place for beginning adventurers to try their hand at collecting cichlids, whether it is to collect photographs or to try to bring home a rare species.

From a cichlid point of view, Panama is a country with incredible diversity. The country, around 500 miles west to east and rarely more than 100 miles wide, is bordered by Costa Rica to the north and by Colombia to the south. Mountains run the length of the country, separating the oceans. To the west are cichlids we may recognize as Central American, but to the east are the first examples of *Geophagus* and *Plecostomus*.

Fish of the Rio Gariche

After flying into Panama City, it takes about five hours to get to David near the border with Costa Rica. Just west of David, the Pan-American highway crosses the Rio Gariche. There we found a great cichlid, *Tomocichla sieboldii*. While some may say this fish is not much to look at, its breeding dress—a dramatic juxtaposition of black and white markings combined with a black mask across the face—makes it a sight you will not soon forget. It is a powerful riverine fish that can get up to 10 inches, but it is best to try to breed it way before it gets that big—try breeding at 3 inches for the females and 4 inches for the males. Size is one of the few determining factors in telling what sexes you have, the other being the blotch of black pigment found in the dorsal fin of the female that is missing on the male. This trait is common, though not universal, among many different kinds of Central American cichlids.

To breed *T. sieboldii*, I recommend a tank of at least 75 gallons. Place four to six adults into the tank with plenty of rockwork and flowerpots on their sides. Let nature take its course, but when you see a fish with torn fins, it's best to remove it as soon as possible before things get out of hand. Soon enough,

the only fish remaining will be a pair. Spawns can be over 100 in number. The fry are guarded fiercely by the parents and grow quickly on brine shrimp and finely crushed flake food. A breeding pair offered for sale is easily sold, but beware; they can be seriously aggressive for their size.

The other cichlid commonly found with *T. sieboldii* is *Andinoacara coeruleopunctatus*, plus the usual tetras and livebearers. *A. coeruleopunctatus* was found throughout the Pacific Slope east and west of the Canal Zone. It is a more peaceful cichlid, also an egg layer, and can inhabit a planted aquarium. I found the species flock of gobies living in the Rio Gariche to be more interesting. There were at least three different kinds, including a sucker-mouthed type, a predatory type, and a more generalist feeder.

Bocas del Toro

Moving north from David over the continental divide brings you to the Bocas del Toro area and many rivers including the Robalo, Cana, and Canaveral. These rivers are rocky and fast flowing, which, at the time, meant for some tough fishing, but perseverance paid off. *Tomocichla asfraci*, a large riverine cichlid named after the French Cichlid Association, came reluctantly to the net. Commonly known as a *Chuco* species, this fish has not yet become widely available in the hobby, but not for lack of beauty. The orange and black markings are very striking. In physical shape it is similar to fish found farther north in Guatemala and Mexico, *Theraps microphthalma, T. godmanni, and T. intermedia*. However, the name *Chuco* has officially been abandoned. Whatever the final nomenclature, the geographic distance between these groups is enough to suggest that they belong to different genera.

Also found were the secretive dwarf cichlids *Cryptoheros nanoluteus*, colored brilliantly gold, and a convict type, *Amatitlania kanna*. The ubiquitous antherinids, silvery fish sometimes referred to as Central American rainbowfish, were easily captured but often expired before they could be removed from the net. The surprise capture of the day was a freshwater pipefish.

■ The Rio Ipeti; Panama's diverse waters are home to a range of cichlid species.

■ The Bocas del Toro region offered a female *Cryptoheros nanoluteus*, a dwarf cichlid easily identifiable by its gold coloration.

Adventure and *Cryptoheros altoflavus*

There are no roads to the east of this area along the Atlantic Ocean, so if you really want an adventure, you can hire a boat to take you into some of the more isolated areas. That is the story of how *C. altoflavus* was discovered, a species very similar to *C. nanoluteus* that is also rarely seen in the hobby.

We tried to find it by driving north from Santiago, thinking we would go over the mountains. Near the town of Sante Fe, we learned that it is only by truck that you can go down the mountain, and you do not know when it might be coming to take you back. If it rains, which it is known to do occasionally in Panama, the road may be closed for days. Plus, there was little food or other supplies to be had at the coast, so be prepared to bring whatever you may need for an extended stay. Maybe next time. What we did find, at an altitude of over 500 meters (1640 feet), were fish very similar to *T. sieboldii*, though smaller in size. This was the highest altitude where we found cichlids. The river was extremely swift and full of rapids, though the fish we captured were in a more peaceful side channel.

■ *Tomocichla asfraci*, found in the Rio Gariche.

Rio Ipeti

While you can collect in the Canal Zone itself, we passed by that opportunity and headed east along the Pan-American Highway into the Darien. This part of Panama is sort of a no-man's land still claimed by Colombia. It is home to people living as they have for centuries, with armed groups fighting for freedom or control of the drug trade. The farther east you go, the dicier it gets. Our destination was a river flowing north into Lago Bayano, one of the reservoirs supplying water for the canal.

Known as the Rio Ipeti, it was here that I experienced my first collecting trip to South America. Ichthyologically, we had definitely crossed over. The river had plecostomus, rubber lips, whiptail cats, and some really beautiful cichlids. *A. coeruleopunctatus* was there along with another robust egg layer, *Amphilophus calobrensis*. My favorite was *Geophagus crassilabris*, a mouthbrooder that can reach 10 inches in length. The lips on this beast were truly spectacular. But the specimen that was described must have been already pickled because the red color of the face, belly, and fins on the male, paired with the iridescent green sheen of his scales, made for a most magnificent animal. This mouthbrooder has fairly small spawns, only 40 to 50 fry, and while it is occasionally available, is not well established in the hobby.

Other odd fish we encountered included mountain mullet (*Agonostomus monticola*) and a strange loach-like endemic, *Saccodon dariensis*.

If you were to head east from the Rio Ipeti, you would find other cichlids, such as ex*Cichlasoma tuyrense* and the truly monstrous *Caquetaia umbrifera*, known fondly as umbies. This fish rivals *Parachromis dovii* as the largest Central American cichlid—that is, if you still think the Darien region of Panama is in Central America.

An Interesting Return Trip

On the way back to Panama City, across Lake Bayano and through the military checkpoint, we were stopped and had our passports taken for 15 minutes. Then the officer asked us to give one of his soldiers a lift home. How could we say no? That was one ride I will never forget, especially the part where he told us the cheapest place in town to buy beer and proceeded to buy some for us. We were having such a good time that we drove right past his house.

Panama is remarkably safe and has many plants, fish, and other animals for me to recommend it as a prime travel spot. I am sure there are more discoveries waiting to be made. If you get a chance to acquire some of these fish, you will not be disappointed, as their colors and behaviors are enough to make the most jaded cichlid keeper smile.

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import report

Madagascar Lace Plant (*Aponogeton madagascariensis*)

Aponogeton madagascariensis is native to the African island of Madagascar and has been naturalized in Mauritius. Often called the skeleton leaf plant or Madagascar lace plant, it is unique because the plant tissue covers only the veins of the leaves, which allows moving water to pass through the leaves without damaging them. Leaf growth comes from a bulbous tuber, and the roots go deep into the substrate.

The rivers in which it grows are cool—64° to 79°F—with a pH of 5.0 to 7.3 and often flow at a fast pace. These rivers typically feature a nutrient-rich, slightly rocky, sandy bottom. This plant has been found in both slower-moving forest streams and in deeper, fast-moving rivers.

In the aquarium, this plant does best in lower temperatures with a nutrient-rich, coarse sand substrate and slightly acidic water. Good water movement, high oxygen levels, and a low level of dissolved organic compounds are crucial to keeping it healthy. You should not allow particulates to build up on the leaves. Medium light intensity is best.

There are narrow-leaf and wide-leaf varieties, though both can grow to be quite large and need sufficient room to spread out their leaves. Ailing leaves should be cut off at the base just above the tuber and not allowed to decompose in the aquarium. The tuber should either sit on top of the substrate or be just partially buried, but be careful not to bury it completely. However you choose to place the tuber, the roots will find their way deep into the substrate, so be sure to provide a substrate that is at least 4 inches deep. Because of its size, the plant should be placed toward the rear of the aquarium and the water flow should be from the side of the plant to prevent the leaves from being pushed to the front.

Rotala sp. "Bangladesh"

Rotala sp. "Bangladesh" is a regional variant of a *Rotala species* that has not officially been classified. It is being grown and traded among hobbyists on the Internet. There is very little information available about the plant, but a few people claim that it may be a variant of *R. mexicana*. Its leaves are fine but not exactly needle-like, and the tops will get a little red when kept under bright lighting.

If it is anything like *R. mexicana*, it requires bright light and fairly high levels of CO_2. Under proper conditions, it grows fairly quickly and requires regular dosing of fertilizer to the water. The stems and leaves of "Bangladesh" are quite thin, and it is normal for the plant to have some space between the leaves except at the tips of the stems where it is densely clustered. It is occasionally imported from some Asian plant farms. Though a little mysterious, this *Rotala* is a welcome addition that brings a very demure look to the aquascape.

Aponogeton longiplumulosus

Found in northern Madagascar, *Aponogeton longiplumulosus* grows in rocky-bottomed rivers that have a strong current. The long leaves have a distinctive look because of their wavy margins and slightly translucent green color. The rivers in which it thrives have fairly warm temperatures of 71° to 79°F, with a pH of 5.2 to 6.2.

This species is easy to cultivate in the aquarium, requiring moderate light, soft to medium-hard water, and a fertile substrate. Water movement in the aquarium is not critical for this plant to prosper, but having some is beneficial. Light should be moderate to bright.

Robert Paul Hudson has been keeping fish and plants for over 20 years. A former importer and retailer of aquatic plants, he now operates the Aqua Botanic radio show and blog at www.aquabotanic.com.

robert paul hudson

photographs by the author

Like all *Aponogeton* plants, *A. longiplumulosus* is best used as a background plant, typically in a rear corner allowing the long leaves to drape across the aquarium. If kept well fed, the plant will last and provide several years of enjoyment. The biggest threat to the plant is an anaerobic substrate, which may cause the bulb to rot or growth to go dormant.

Echinodorus var. "Pinwheel"

The newly introduced pinwheel swordplant is a mutation of *Echinodorus osiris* that was developed by Florida Aquatic Nurseries and launched this year. The narrow leaves have a slight twist to them, which resembles the pinwheel the plant was named after. The leaves generally grow straight up, and new leaves are more twisted than older leaves. Its base coloring is green, but some red coloration will appear if intense lighting is utilized. The pinwheel swordplant generally reaches a maximum height of 10 inches, making it a suitable choice for smaller aquariums.

According to Brandon McLane, President of Florida Aquatic Nurseries, the mutation that created *E. osiris* was accidental and found among their normal growing stock, and then isolated for reproduction in tissue culture. From pictures it may appear similar to a grass-like plant, but it really is not. It has all the same characteristics of much larger swordplants and does not produce ground-level runners. The root structure needs some room to spread out, so you should allow ample space between it and other plants.

Echinodorus var. "Paul Kloecker"

Echinodorus var. "Paul Kloecker" is yet another German hybrid swordplant that is now hitting the US through Florida Aquatic Nurseries. It has similar markings to the ozelot sword, but the leaves are more robust and compact, making this plant less overpowering in stature and more suitable for smaller aquariums than other similar swordplants. The red coloring is more intense on younger leaves of *E.* var. "Paul Kloecker," while more mature leaves have a red-and-brown flecked pattern.

The hybrid is a cross of two other hybrids (*E.* x red flame and *E.* x little bear) and was developed by Tomas Kaliebe, co-owner of the nursery Zoologica in Altlandsberg, Germany, who has developed dozens of beautiful *Echinodorus* hybrids since the 1980s.

Although it is smaller in stature than many other swordplants, it is still too large for many aquascapes. It would fit in best as a focal point in a Dutch-garden aquascape or as a solitary focal point. Moderate or higher light is ideal, with a fertile substrate.

Like most other commercially grown *Echinodorus*, it has most likely grown above water when purchased. These above-water leaves will eventually die as new underwater leaves form. The process is usually gradual in a healthy aquarium, giving enough time for new leaves to replace the older ones. But if conditions are less than ideal, the older leaves may turn brown fairly quickly and should be removed by cutting at the base of the leaf stem.

Elatine hydropiper

Elatine hydropiper is a very small-leaf stem plant perfect for the foreground of an aquarium. As far as I know, little has been written about this plant. It is native to cold regions of Europe, Siberia, China, and northeastern Canada, where it is found in very shallow pools, along river banks, and in marshy areas. It grows both as a fully aquatic plant and in terrestrial mud.

Anubias of Italy, a commercial grower specializing in offering rare plants to the hobby, has introduced this plant to planted aquarium enthusiasts in Europe. As a result, it has found its way to some collectors here in the US. It creates a dense, low-growing carpet and reminds some hobbyists of a dwarf *Glossostigma*.

E. hydropiper is notable because it grows very slowly, unlike the related *E. triandra*, which is much more common and considered a fast-growing and potentially invasive species. It is also unknown how well this plant will tolerate the higher temperatures often maintained in aquariums, but reports originating from Italy have not mentioned any type of temperature issues.

Its aquascaping potential is that of a carpet plant and would ideally be used in smaller, more shallow aquariums. It would be perfect for shrimp tanks and *iwagumi* aquascapes.

E. hydropiper is a very attractive plant that I have recently been able to obtain, and I look forward to experimenting with it.

Ranunculus inundatus

Ranunculus inundatus is a unique-looking plant that comes from Australia, where it grows in shallow water and mud flats. In the aquarium, it is a low-growing plant that creeps along the substrate. It will also easily grow above water, where the stems become much taller. Moderate to bright light is needed, and it is not too particular about water conditions. The plant is imported from Asian plant farms and traded among hobbyists. It is an attractive plant for any freshwater aquarium.

In aquascaping, it is used as a foreground plant, not so much as a carpet, but more as a foreground group or stand and in thickets around wood and rock. The stems may be cut at any leaf node and replanted. The photo above shows new underwater growth in between the tall leaf stems of emergent growth.

Egleria fluctuans

Egleria fluctuans is a branching, floating stem plant that will root in the substrate if planted. It develops reddish stems and fine, hair-like leaves that sway gently in a current. It is native to Brazil and Venezuela where it is found in soft, acidic waters. In hard water the stems become very brittle and darken. Fairly strong lighting is needed for lush growth, and added CO_2 will help provide a pH below neutral and accelerate growth.

This plant is not currently grown or imported by any commercial grower in the US. It may be found occasionally by dealers who import plants and by hobbyists selling them on the Internet. As long as its minimal requirements are met, it is an easy plant to grow and does so fairly quickly. Propagation is from cut stems.

Fitting this plant into an aquascape is a challenge, but I am sure someone will find a way to make it work. Its very fine leaves stand out best if there are no plants behind it and the background is dark. It should serve well in breeding tanks as a hiding place for fry.

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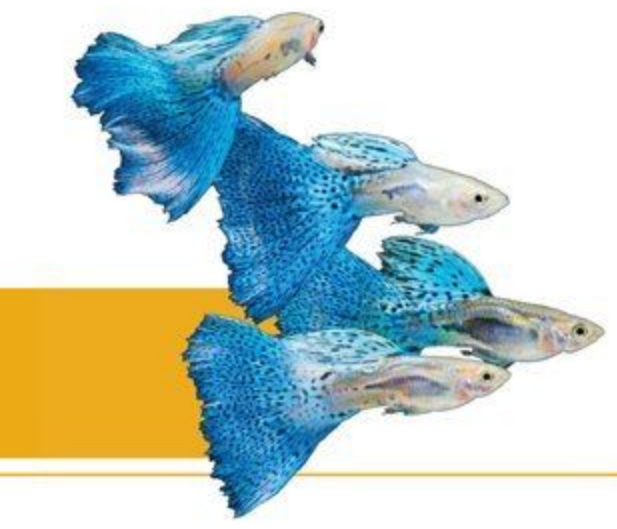

life with livebearers

Raising Guppies

Much of what hobbyists have been told about rearing good-quality guppies is wrong. Now that I have your attention, let me first tell you this column was prompted by an email from 12-year-old Toby asking for tips on raising guppies. Second, the first sentence is true. I'll explain.

First Guppy Experience

Way back when I was 12, I got my first guppies, some nice blue deltas, along with my first aquarium, a 10-gallon, metal-framed tank. The guppies quickly rewarded me with fry, which were, unfortunately, just as quickly devoured by their two tankmates—angelfish. The angels were separated out, and the guppies got sole possession of the tank.

Reading everything I could on raising quality guppies, I heeded the advice of the experts. That advice went like this: 1) one guppy per gallon of water, 2) feed newly hatched brine shrimp, 3) change 25 percent of the water weekly, 4) in addition to daily feedings of brine shrimp, feed once a day with a good dry food, 5) place gravid females in breeding traps to save the fry from their voracious mothers (even at 12, this seemed a little counterproductive on the part of the females), 6) raise virgin females and mate them to your best male, and 7) start with the best breeding stock you can find.

I did as instructed and, after acquiring a few more tanks, developed a nice strain of blue deltas. Later I added some half-black red deltas and red deltas.

Each month my doting grandparents drove me 2½ hours to Houston to sell my guppies. Since they bore the cost of gasoline, transportation, and meals, I did well financially. It was on one of these trips that my first doubts about the expertise of the experts arose. Delivering guppies to a shop out on Telephone Road, I saw some fantastic half-black yellow deltas. The large males sported huge tails and carried them well; their bodies weren't dragged down by the weight of their massive tails. I asked the shop owner about them and was told that "Old Man Dudley" raised them. It turned out that Mr. Dudley lived only a mile or so down the road. I called him and was invited over.

A Life-Altering Encounter

Mr. Dudley kept his fish in a backyard portable building, probably 10 feet by 16 feet. The building was filled floor to ceiling with 2 x 4 racks holding 10-gallon aquariums. The tanks were placed short side out. Each tank had an open-ended airline with plant lead ties wrapped around them to weigh it down. Air was virtually exploding out of the ends of the airlines, boiling water up 2 to 3 inches above the surface. Each tank was only ⅔ full; any more water and it would have bubbled out of the tank. There were no filters to be seen. The aeration was so vigorous that the fish were constantly swimming to maintain place. Instead of 10 male guppies in a 10-gallon tank, there were about 100. In the breeding tanks, there were 5 to 10 males and maybe 50 females with fry of various sizes swimming among the adults. As we squeezed through the narrow passage between racks of tanks, Mr. Dudley dumped large amounts of food into each one and was rewarded with a guppy feeding frenzy. Uneaten food clumped on the bare bottoms of the tanks to be picked at by the fish later.

I was in a state of shock. Mr. Dudley was producing top-quality guppies in large numbers in a very small space. I quickly thought about the increased production

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.*

charles clapsaddle

I could achieve if his results could be replicated.

Mr. Dudley explained that he changed 50 percent of the water daily so he could get away with overfeeding to ensure the fish were never hungry. He told me the fish grew faster and eschewed eating fry when fed properly (by properly, he meant continuous access to food). Besides the dry foods, he fed newly hatched brine shrimp and didn't worry much about introducing too much salt due to the large water changes. He figured the salt was a good tonic anyway.

Thwarting Conventional Wisdom

I regret to report I failed to implement Mr. Dudley's system. I instead began raising guppies in outdoor pools. With a nine-month-long outdoor growing season in South Texas, I could produce many fish. I did crowd the fish at the beginning of winter, mainly due to lack of tank space. I also increased my water changes. But that was it. Shortly after that, I got into killifish and the guppies were forgotten.

Fast forward to about 10 years ago: We'd relocated our hatchery from the mountains of New Mexico to coastal South Texas. The rainbowfishes we'd specialized in while in New Mexico were losing their commercial luster at that time, and we looked for other fish to raise. Also, since we were within a few hours of about 80 percent of Texas' population of 25 million, we figured offering a more complete line of fish would allow us to sell to retailers instead of the wholesalers who had bought our rainbowfishes. This process was "helped" along in 2003 by a surprise hurricane by the name of Claudette. This storm crushed our greenhouse, breaking water and air lines, causing a massive loss of breeding stock. After rebuilding twice as large, we added many livebearers, including guppies.

In the intervening decades, I'd learned a lot about raising fish. After reading everything I could about aquaculture, which uses intensive rearing techniques to produce lots of fish protein in limited space and water, I'd taken Mr. Dudley's crowding techniques to heart. I'd learned that crowded fish are less aggressive (we keep as many as 100 adult male peacock cichlids in a 50-gallon vat) and that they eat more and grow faster. I'd also learned that fish exposed to fry cease to consider them food and that a little cover in the form of our plastic-mesh breeding cages offers fry enough cover for the adults to get used to them.

Bluehand/Shutterstock

■ The author found that crowding guppies together encouraged them to eat more, speeding their growth.

Bluehand/Shutterstock

■ If you can obtain superior guppies to breed, you will produce better offspring in a shorter period of time.

Prepared foods, especially those used by the aquaculture industry, had improved to the point that feeding live foods, especially messy brine shrimp, was no longer necessary. I'd had time to develop systems obviating the need for massive water changes to maintain water quality (although, large water changes are certainly one way of handling the problem of water quality). If you refer to the beginning to my list of seven conventional wisdoms, that resolved the first five. The remaining two include raising virgin females and starting with the best breeding stock possible.

Raising Females with Males

We'll deal with virgin females first. Raising virgins is a pain. They don't wish to remain virgins, and the males, even barely mature ones, will quickly ensure they don't remain virginal. The reason put forth by the experts for raising virgin guppy females is ensuring male parentage. Why is this the case? Because guppy females, like all females in the family Poeciliidae, are capable of storing sperm and using it for up to six batches of fry. So if your prize guppy female gets knocked up by a feeder guppy male, she can have up to six deliveries with fry from that mongrel male. As a result, guppy breeders painstakingly raise virgin females just so they know the father of the fry (DNA paternity testing hasn't gotten cheap enough to test 75 fry).

How do they raise virgins? Most carefully watch a tank of juvenile guppies, removing any fish with a hint of a thickening gonopodium (the male's penis-like intromittent organ). I don't know how many times I failed to notice a male or went away for a weekend to be rewarded with a tank full of gravid females. To avoid this, some people isolate fry one to a container. This is a problem due to the difficulty of maintaining water quality while adequately feeding.

I used to candle the juvenile fish to identify females. This is done by placing the fish in a small tank in a dark room

Sailesh Patel/Shutterstock

If you choose to breed two guppies, most of the offspring will come from the chosen male instead of one the female bred with earlier.

and shining a light through the fish from behind. The female's dark gravid spot can be seen even when she is small and not yet fertile. The term "candling" comes from the poultry industry. Lights were shined through eggs to remove infertile or non-developing eggs from incubators. I suppose actual candles were used in the distant past.

Now, the reason poeciliid females store sperm is because in nature, males are rare. Males foolishly sport bright colors and large fins to seduce the females. More often than not, they end up being a predator's meal instead. We once collected about 750 female mollies from Texas' Comal River and got only 3 males. I thought about this and wondered, what if a female mated with a substandard male and later found a much better male? With sperm storage, she might be stuck for a lifetime with substandard sons. So, I wondered if new sperm might just replace or be more viable than stored sperm. I researched the literature and found others had wondered the same. Conducting some tests using specific genetic markers, I found that if a female was mated to one male and then placed near her delivery time (Poeciliidae females are in estrous just after delivery of their fry) with a different male, virtually all of the next batch of fry would be from the new male. I immediately lost interest in raising virgin females, except in special cases, such as attempting to create interspecific hybrids. I simply put my best females with my best males, discarded the first batch of fry, and eagerly awaited the superior offspring of my best males.

Start with the Best Stock

Okay, we now have one issue left, starting with superior breeding stock. The experts were right. Why spend years trying to combine the best characteristics of mongrel fish when you can buy fish already endowed with them? Buy the best fish you can find. If you want to raise half-black red deltas, buy the best from several sources. Use some to maintain separate lines, but also cross each line with each of the others. Select your best fish. Discard those not producing for you. Raise tons of fish, and cull ruthlessly. But start with the best stock. Paying $125 for a superior trio of fish will save you years of breeding over a run-of-the-mill trio costing only $25.

One important topic I didn't include in this column is inbreeding, and probably everything you think you know about inbreeding is wrong, dead wrong. This topic, along with the selection of breeders, deserves its own column. I'll do that sometime in the near future.

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

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adventures in aquascaping

Mr. Saltwater Tank's 235-Gallon Reef Challenge, Part 4

When we last left my new build, things were calming down after a mini die-off. I'd lost a few fish, sure, and I thought I'd found things to attribute the deaths to: cyanide captures, that sort of thing. Things had leveled off, and I was sure this final installment of "Adventures in Aquascaping" would be about ongoing maintenance of my tank.

Turns out, I was wrong.

If you've read this series from the beginning, you know I had some terrible luck with my new, 235-gallon tank. Unfortunately, just when I thought it was over, the worst part hit. That's why when I sat down to write this piece, I was in the process of cycling a completely re-aquascaped tank rather than keeping up with the one I'd built. In other words, I was completely starting over. How did it happen? Two terrible words: Marine velvet.

Too Little, Too Late

Marine velvet (*Amyloodinium ocellatum*) is a parasite similar to ich, only deadlier. It's extremely difficult to detect, and it's an effective killer. The disease first manifests itself in a fish's gills, often causing the fish to hyperventilate or rub its gills against rocks. Hyperventilation and gill rubbing are hardly definitive diagnosis, however. Some fish hyperventilate naturally. My blue-green chromis for example, has hyperventilated since the day I got him years ago. Therefore, you can rarely catch velvet at this stage, and the only way to be truly sure is to clip part of the gill and look at it under a microscope—something I'd never recommend, since it's well beyond the capabilities of most hobbyists.

Unfortunately, velvet is typically identified only when it's visible on a fish's body—giving it the appearance of being coated with powdered sugar. By this point, it's extremely unlikely that the fish can be saved, as few fish survive treatment.

And that's what happened in my tank. One day, my fish were behaving completely normally. The next, three Bartlett's anthias (*Pseudanthias bartlettorum*) had died. A day later, two zebra barred dartfish (*Ptereleotris zebra*) had disappeared. I was bummed—and more than a little curious.

My remaining fish were eating and swimming happily. My tank parameters were perfect: no ammonia, no nitrites, nitrates around 5. My equipment, pump, and LED light fixtures were performing as expected. I'd started the tank with dry rock and dry sand, so there was no chance of a hitchhiking predator.

Then I saw it: My white stripe maroon clownfish (*Premnas biaculeatus*) showed up looking like it had been hit with powdered sugar. I was devastated, and so was my fish population.

By the time the die-off finally ended, I'd lost 12 fish in six days—and the parasite had been completely undetectable for the first four days. The lethal and often silent killer marine velvet had struck again.

Moving On

Four of my fish—two blue chromis (*Chromis viridis*), a leopard wrasse (*Macropharyngodon meleagris*), and a pink spot goby (*Cryptocentrus leptocephalus*)—survived the velvet outbreak. There's evidence that fish can build up a resistance to the parasite, and I'm guessing that's what happened in my tank. They immediately went into a hospital tank where they, thankfully, never showed any signs of marine velvet after weeks of observation.

Mark Callahan has loved (un-frozen) water since his childhood years in Tennessee. As a child, he spent eight months a year on a lake and traveled with his family to Maui each spring break. He learned to scuba dive there at the age of 12 and has been addicted to the ocean ever since. He owns and runs MrSaltwaterTank.com, the number one online resource for dedicated saltwater tank owners. He offers informative videos, articles, posts, and guides for marine and reef aquarium lovers.

mark callahan

photographs by the author

Some aquarists treat marine velvet by letting the tank sit fallow—that is, without fish—for a period of time (usually 30 to 60 days). The theory behind this is that, since velvet is a parasite that attacks fish, it will die without a host being present. Once bitten, twice shy, I decided to go one better: a complete teardown. That's definitely no fun, but it was the only way for me to help make sure I wouldn't re-introduce the parasite.

After carefully removing all of my invertebrates and corals and draining the (once beautiful) 235-gallon tank, I went into full-on nuke mode. My sand went into three tubs, where it got a healthy dose of tap water and bleach. Same deal with my rock: horse trough, tap water, bleach. Nothing was going to live through that, and if something did, the end of the world is clearly coming—fast!

To sterilize the tank, I ran a good old fashioned mix of chlorinated tap water and vinegar through the system, wiping out any bad stuff that might possibly be left in the plumbing.

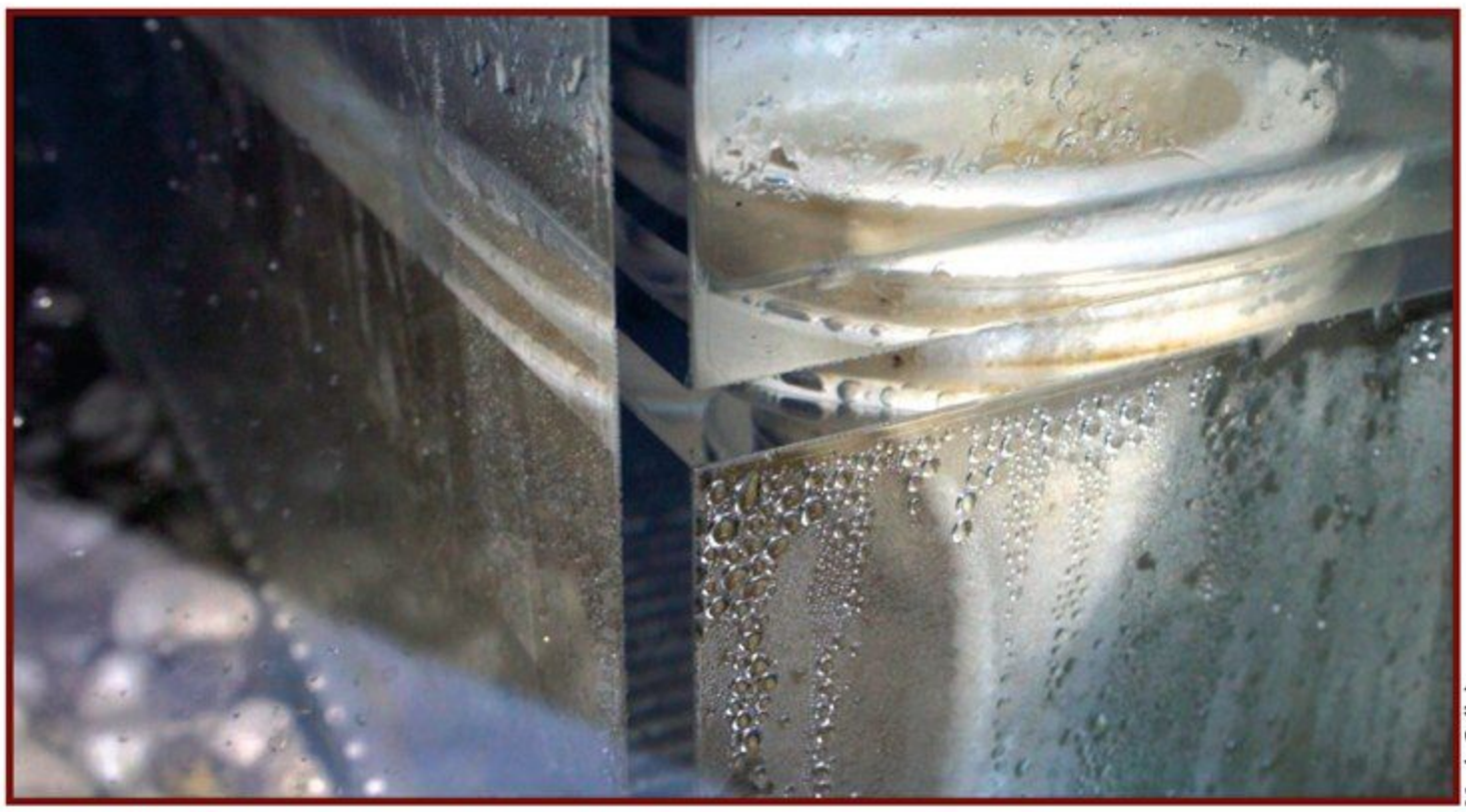
Finally, it was time to rebuild. Here, I hit the one silver lining of the entire affair: Getting my hands on a shiny new piece of equipment.

All Over Again

Haven't we been here before? My tank was empty, and it needed filling. My plan was to largely repeat my previous steps, but with one major difference. This time, I had the Ferrari of sumps at my disposal.

My first time through this build, I'd had a buddy build me a sump for a few hundred bucks. He'd done a good job, all things considered, but after living with it for two months, I was ready for an upgrade. So I called my favorite sump designer, dropped some cash, and got back an absolute thing of beauty.

My new sump was made of ⅜-inch acrylic. If I had the strength to pick it up (it weighs 80 lbs empty), I could lift it by the narrow eurobracing; the sump wouldn't break. Add-on lids for the filter sock areas, no air bubbles in the seams, everything tightly sealed, no salt creep, *zero* noise—perfect. Then add on the built-in probe holders for my aquarium controller as well as holders for the effluent lines when it is time to dose my tank, and you can see why I call this new sump the Ferrari of sumps. My old sump could be heard clear across the house. This one is nearly silent, and I can't hear it in the same room! My advice is to spend money on a good sump; it's worth it.

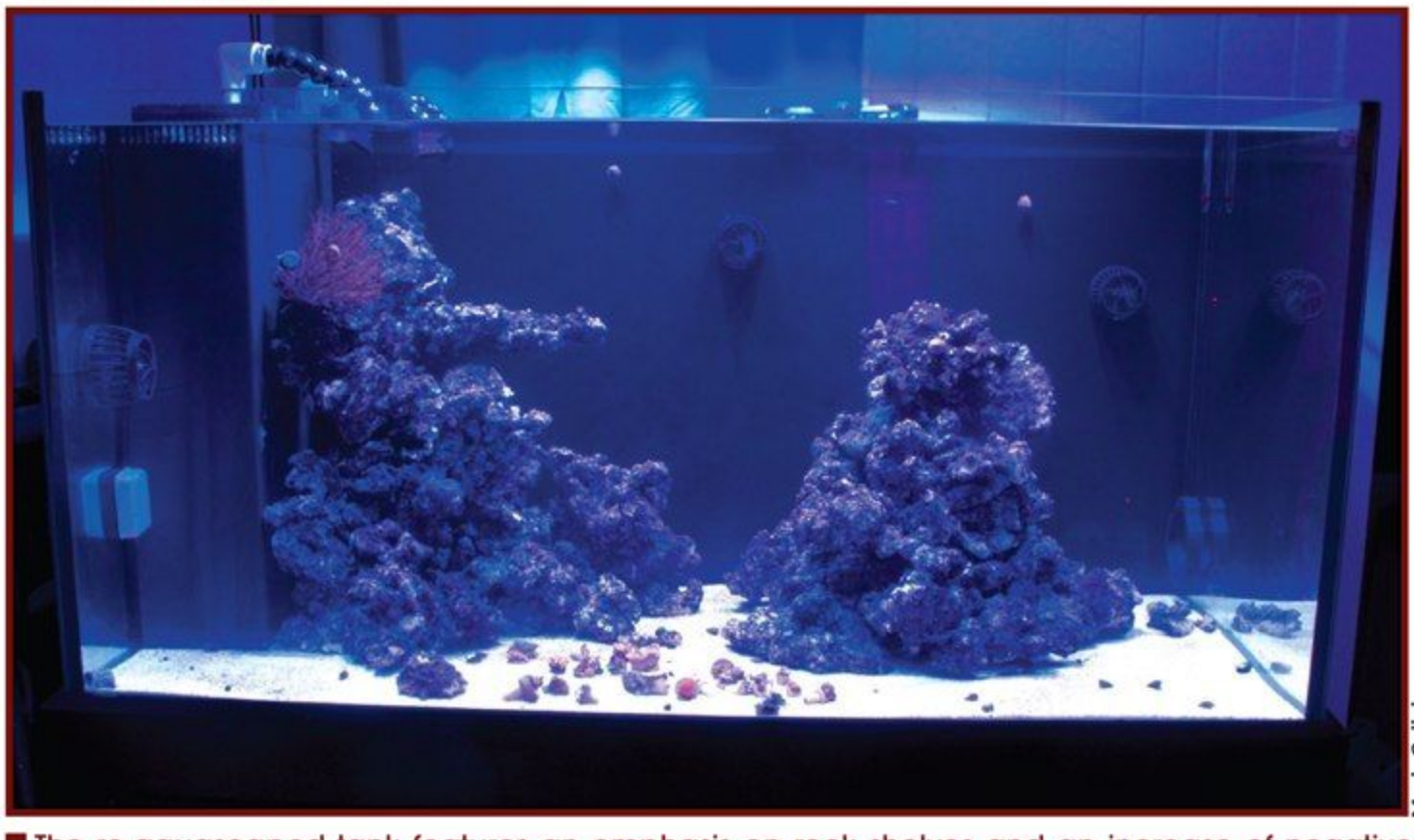


Mark Callahan

■ The author's new sump was constructed out of ⅜-inch-thick acrylic.

Mark Callahan

■ With plenty of practical features and nearly silent operation, this could be considered the Ferrari of sumps.



Mark Callahan

■ The re-aquascaped tank features an emphasis on rock shelves and an increase of negative space.

Another bonus of a full rebuild was a chance to re-aquascape. Originally, I prepared the tank with a two-island look. It was nice, but there was definitely room for improvement. I wanted to build more rock shelves (creating prime real estate for flat corals beneath my LEDs) and increase my negative space (carving out a nice spot on a sand bed for a couple of clams). The result was a slightly sparser, but probably more functional, display look and feel.

Let There Be Life, Again

Just like the first time, making my tank salty was easy: Fill the tank with RO/DI water from my 150-gallon/day system, dump salt in the sump, test, add more salt, test, repeat. After getting the specific gravity to 1.025, or 33.2 ppt, and the temperature to 77°F, it was, once more, time to cycle.

If you read part two (*TFH* June 2012) of this series, you know my thoughts on cycling. Basically, I don't believe in the old notion of adding live rock and some hardy fish, riding out spikes, and eventually landing on a comfortable nitrate level. I find it inefficient, overly lengthy, and, frankly, more than a bit cruel to the fish involved.

Because of that, and because all of my surviving fish were still under observation in a hospital tank, I decided to go with a fishless cycle. Using ammonium chloride and nitrifying bacteria, I cycled my tank over the course of several weeks, making things safe for habitation.

And as I write, that's where things stand. My fish are nearly through their quarantine period, and they'll be back in their home soon. I've already added some corals to the tank because I couldn't stand staring at an empty tank. Soon after that, it'll be time for a full-on restocking. Yes, even after all I've been through with this tank, there's a light at the end of the tunnel.

Closing Thoughts

Someone once told me that the difference between a good aquarist and a great aquarist is how many times they've had to crash, burn, and start over. If that's true, by the time this 235-gallon build truly ends, I'll be a *fantastic* one.

I've hit obstacles since day one, when I overfilled my moving truck and couldn't pick up my newly built tank. The rental house in Tennessee needed major work before I could even move in. The room where my tank now sits was supposed to be on a slab—it wasn't. Then came a mini die-off and, finally, a marine velvet outbreak. No, it hasn't been easy. But it's been worth it.

A lot of places along the way, I could have gotten frustrated and given up. I'm thankful I didn't. In the end, it was worth it to me to have lived, learned, and picked up the pieces as I went along.

Especially vindicating has been the chance to share my journey with readers of *Tropical Fish Hobbyist* and visitors to my website (MrSaltWaterTank.com). I've had easy builds, and I've had hard ones. Frankly, I think the latter is probably more common. If my story has helped inspire one more aquarist to hang on, push through, and finish the job, it's all been worth it.

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the salt mix

Tridacnid Reproduction (and the Lack Thereof) in Aquariums

James Fatherree, MSc, has had more than a quarter century's experience with aquariums of all kinds and has been deeply involved in the reef hobby for more than a decade. His background includes diving, collecting, and photography, and he has worked in the trade on both retail and wholesale levels. With all this experience, he has seen his share of aquarium disasters, both natural and manmade, making invaluable his insights on how to save your tank during a crisis.

james fatherree

photographs by the author

Tridacnids, also known as the giant clams, are currently being aquacultured for the hobby. They may also attempt to reproduce in aquariums, but while thousands of them can be grown on large-scale clam farms, they won't successfully increase their numbers in home aquarium systems no matter how often they may try. I know that's disappointing, but tridacnid reproduction is still an interesting subject, and I'd like to address why they will reproduce in the wild but not in our tanks.

Tridacnid Spawning

As tridacnids age, they first develop male gonads (testes) and then develop female gonads (ovaries) later, meaning they're hermaphrodites when fully mature, with the ability to produce both sperm and eggs simultaneously. Once they develop gonads, they can begin to spawn, with younger clams ejecting only clouds of sperm into the surrounding waters and mature clams ejecting both. When spawning occurs, these sex cells can potentially meet up with the sperm and eggs from other nearby clams and some of the eggs can be fertilized. You'd think the odds would be low for single cells to meet up in the churning waters around a reef, but they can produce tremendous numbers of them to increase the chances of success. Just to put it into perspective, *Tridacna crocea*, the smallest giant clam, can eject several million sex cells in a single spawning event, while *Tridacna gigas,* the largest species, can eject up to 500 million.

When spawning does occur, whether it be sperm only or sperm and eggs, a clam will usually strongly contract its body and forcefully eject the gametes from its body. This can be seen as clouds of sex cells shooting from the smaller of the two openings in the clam's fleshy mantle tissue, which is called the exhalant siphon. However, the sperm and eggs aren't ejected at the same time because the sperm and eggs of a single clam can fertilize each other and self-fertilization makes for bad genetics. During a typical spawning event, all of a clam's sperm are ejected first through a series of contractions and the eggs are then ejected in the same fashion several minutes later. It often starts with just a few sperm being ejected at first, with the quantity increasing with each contraction until the clam is spent. The sperm can thus be dispersed by water movement before the eggs are ejected the same way.

Spawning can occur at any time during the year in the perpetually warm waters near the equator, but it typically takes place only during the warmest months in other areas. However, changes in salinity and the tides may influence the timing as well.

It's also important to note that when one clam begins to spawn, it ejects chemicals called spawn-inducing pheromones along with the sex cells, which entices other nearby clams to also spawn. Once spawning is initiated, all of the clams in an area will typically join in to add many, many millions of sex cells to the surrounding waters at roughly the same time. This

ensures that there will be some degree of genetic mixing between individuals. I should also mention that while healthy and mature tridacnids regularly spawn as a normal part of life, they may also spawn if they're mature and are subjected to too much stress. When something goes wrong, a clam may respond by ejecting any gametes it's holding, as this may ensure the survival of some of its potential offspring if it should be killed. This is typically called survival spawning, although the survival part of the term doesn't usually apply to the clam doing the spawning.

Tridacnid Life Cycle

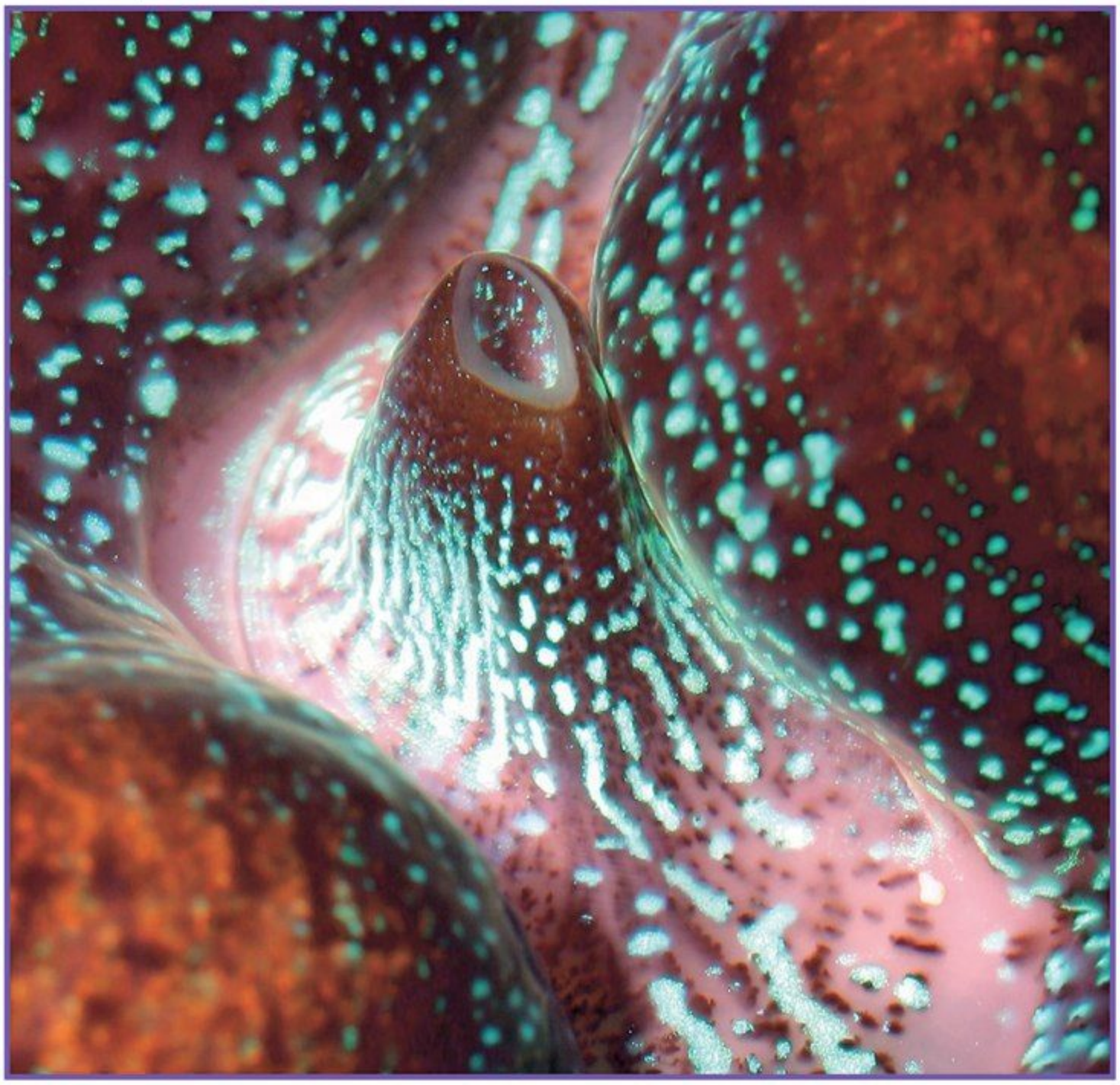
If an egg does happen to get fertilized, it starts to divide and grow very quickly. In fact, it'll go from a single cell to a tiny larva within a matter of hours and can swim around (weakly) under its own power using rows of tiny hair-like cilia. Of course, waves and currents move them around a great deal, so they can travel quite a bit for something that's only a tenth of a millimeter in size. The baby clam is called a trochophore larva in this initial phase, but within another 12 to 36 hours, more changes come about and the clam-to-be moves into the veliger larval phase.

When the larva becomes a veliger, the digestive tract begins to form and the larva will soon begin to feed on particulate matter in the water. It'll also start to make its shell, albeit a very, very small one in the beginning. Then, after somewhere between three and ten days, the veliger will develop a muscular foot and then becomes a pediveliger.

This foot-like structure, which looks more like a small tongue, can be used to help the larva move around on the bottom. Once it has developed, the larva will alternate between swimming around and crawling around for the next one to four weeks. It can also be used to collect food particles. The larva continues to feed, grow, and move around for quite a while at times before settling down in one spot for life.

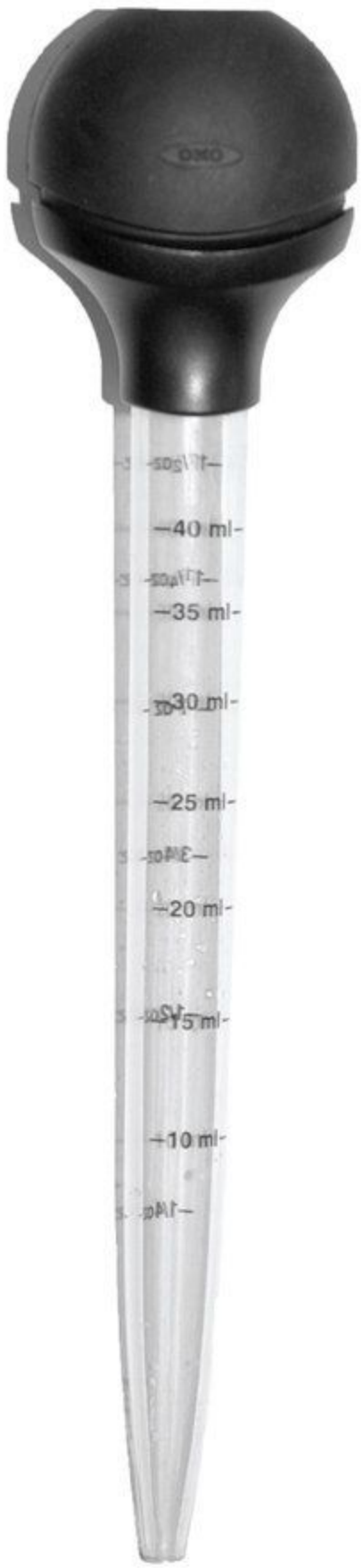
When the pediveliger stops moving around, it'll undergo a metamorphosis and begin to change from a larva to a juvenile clam. As this occurs, the clam loses the ability to swim and the post-metamorphic clam, for the most part, looks just like a tiny version of an adult—a very small one at that, as it'll still be something like 2/10 of a millimeter in size. Regardless, a specialized system of thin tubes, which are used to hold a clam's complement of zooxanthellae, begins to develop at this point. They don't acquire these single-celled algae from their parents, however. They must collect them from the surrounding waters. This is done by straining particulate-laden water through their gills, which is how they will collect various types of food, including phytoplankton, zooplankton, and detritus, for the rest of their life.

■ It can take as long as a couple of years for juvenile clams just to get as big as these farmed 2½-inch specimens.



■ Tridacnids are broadcast spawners that eject gametes from their exhalant siphon (seen here as the tubular structure in the middle of the clam's mantle).

You Baster !



The author's *Tridacna derasa* spawned several times, which is not uncommon for healthy, mature clams. But even after a few years in the tank, it has produced only sperm and no eggs.

As a post-metamorphic juvenile continues to grow and the tubular system continues to develop in the extendable mantle tissue, the zooxanthellae can typically be seen moving into the system within a week. Then the zooxanthellae start to reproduce rapidly, while even more are being collected via filter feeding. Over a period of just one to three weeks, they'll spread throughout the mantle and, from this point on, a juvenile functions essentially the same as a small adult. It can continue to filter feed

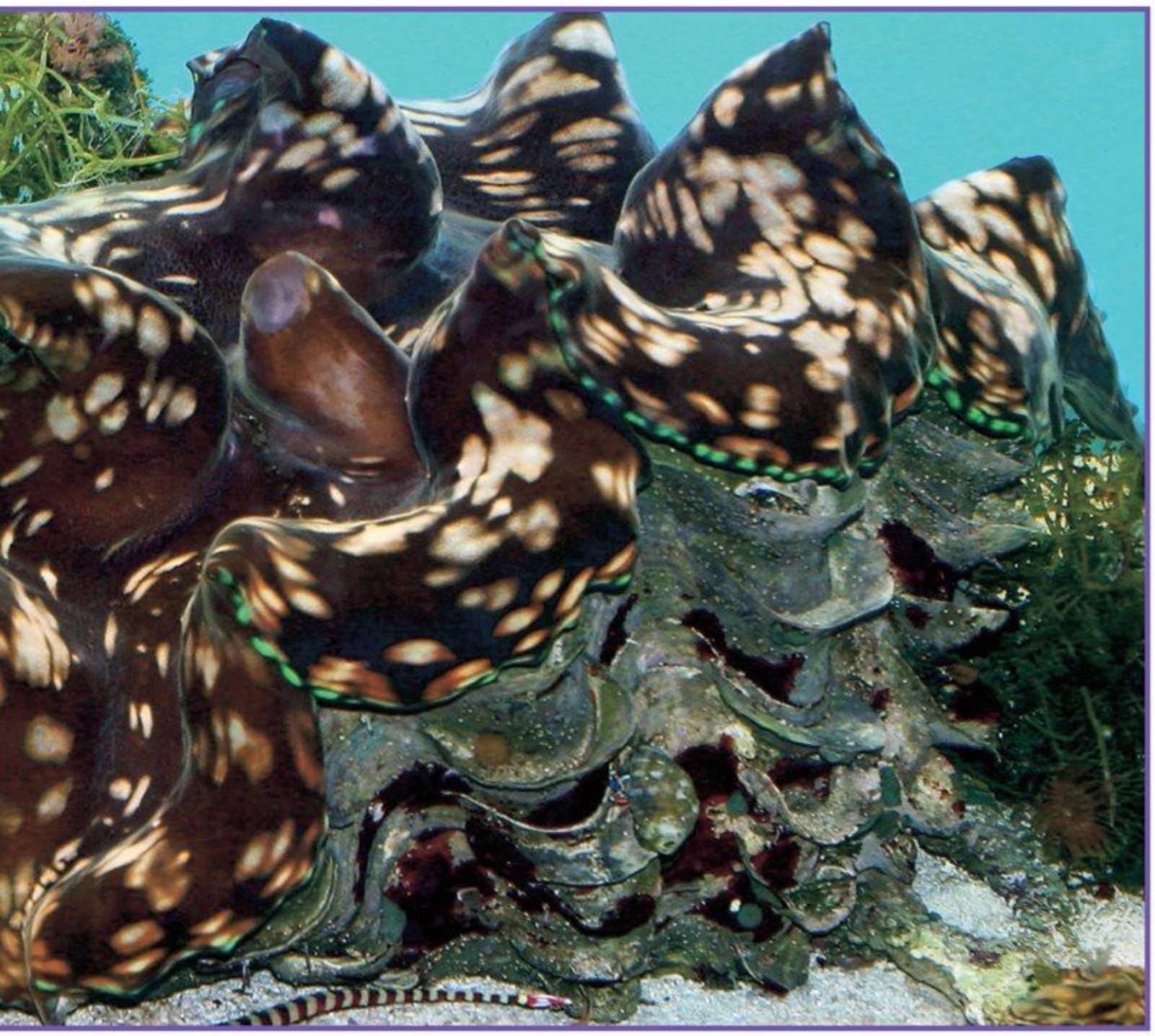
Clams of this size can eject hundreds of millions of sex cells in a single spawning event.

but can also rely on its zooxanthellae to provide it with significant quantities of nutrients just as reef-building corals do.

As you can imagine, there are staggering losses along the way, and they don't stop just because a clam makes it through metamorphosis. There are lots of things around reefs that eat little animals, and a clam's growth rate from this point on is relatively slow. In fact, it may take it several months to reach just a few millimeters in length. So these clams stay small, and especially vulnerable, for a long time. But as they get bigger and bigger, their growth rate actually increases somewhat until they reach sexual maturity and become adults. Of course, that's several years later in most cases.

Depending on what species we're talking about, the individual's genetic disposition, and the environmental conditions it lives under, a clam may become a fully functioning male in as little as a couple of years but may not become a functioning female until several more years have passed. For example, it typically takes a big *T. gigas* as long as four to five years to become male mature, but it still may not become female mature for an additional five or six years, even under optimal conditions. Regardless, if a clam does make it this far along, it starts putting more and more of the nutrients

■ To prevent polyspermy and self-fertilization, farmers collect gametes as they are released and keep them separated. They're later mixed in the right proportions, and the larvae are then held in special systems.



and energy it can acquire into making its own sperm and eggs, so there's less left for growth. It doesn't stop growing, but it does slow down.

Why Not in Aquariums?

That's the condensed version of how tridacnids reproduce in the wild, but we've got to take a look at why they never (yes, I said never) reproduce in aquariums. Despite the fact that mature, healthy tridacnids may spawn on a regular basis in aquariums, I have never heard, and suspect will never hear, of anyone finding baby clams showing up in their aquarium. Part of the reason will be obvious, but one of the main reasons is something I haven't mentioned yet.

If sperm and eggs are released in a closed aquarium system, they'll more than likely be killed before things even get started. Oddly enough, if there is an overabundance of sperm, the sperm will kill the eggs. This is called polyspermy, which is what happens when too many sperm simultaneously try to fertilize a single egg. Of course, the sperm are immediately diluted into a gazillion gallons of seawater when spawning occurs in the wild, but the limited volume of water in an aquarium system coupled with the large quantities of sperm released during spawning will invariably lead to a great deal of polyspermy.

There may not be any eggs to get killed in the first place, even if several clams spawn. As I said above, tridacnids don't become completely mature all at once, so most spawning events involving relatively small clams will produce only sperm and no eggs at all. For any real success to occur, you'd have to have at least two fully mature clams and hope all that sperm didn't wipe out all the eggs right off the bat.

Even if some eggs were to be fertilized without being killed due to polyspermy, they'd almost certainly be killed long before they made it through metamorphosis anyway. When in the larval phase, clams are especially vulnerable to microbial attack, and Fitt & Trench (1981) reported that over 95 percent of all the veliger larvae in a study they carried out didn't make it through metamorphosis. Any successfully fertilized eggs would have to get through all that, too.

Still, if by some miracle a few fertilized eggs did avoid being killed early on, they're still terribly vulnerable throughout the veliger and pediveliger phases for another reason, as anything in an aquarium that filter feeds on zooplankton will likely nab them for a meal during the swimming period of a clam's life before metamorphosis occurs. And, if somehow, someway, any baby clams miraculously were to make it through metamorphosis, they'd just be getting large enough to catch the attention of any small fishes, crabs, worms, and so on that are also looking for a meal. Now it should be easy to see why you shouldn't get your hopes up for clams to reproduce in your tank.

Work Cited

Fitt, W.K. and R.K. Trench. 1981. Spawning, development, and acquisition of zooxanthellae by *Tridacna squamosa* (Mollusca, Bivalvia). *Biological Bulletin* 161:213–235.

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Takashi Amano

A Simple *Iwagumi* Layout with *Unzan-seki* Stones

■ Using a new layout material, such as *unzan-seki* and *wabi-kusa*, can provide a fresh, new impression to a basic *iwagumi* layout.

Takashi Amano

translated by Tomoko Schum

One of the original styles of the Nature Aquarium is an *iwagumi* layout. Many variations of *iwagumi* layouts have been created over the years. The impression of an *iwagumi* layout can vary depending on the type of stones, the way they are arranged, and the type of plants that are used in the layout. In particular, changing the type of stones is the most effective method to dramatically change the impression of an *iwagumi* layout. Although various types of stones are used in *iwagumi* layouts, they can be broadly categorized into river rocks, mountain rocks, and lava rocks, depending on their constituents and place of origin. Natural stones are often used, as they are in the case of *manten-seki*, while some are made into different shapes, as in the case of *keirin-seki*.

Unzan-seki

The *unzan-seki* used in this layout have been processed into different sizes while preserving the original, natural lava rock shapes. Depressions for holding *wabi-kusa* (a sphere of densely planted aquatic plants) are provided as well. Although many lava rocks, such as plant rock and *fujiishi*, have been used in the Nature Aquarium in the past, the shape of *unzan-seki* is more natural and varies more as compared to other types. *Unzan-seki* offer more flexibility in terms of size as well. They are used not only in the layouts displayed in the Nature Aquarium Gallery, but also in the giant Nature Aquarium in the Sumida Aquarium at Tokyo Skytree Town, which opened this May. There is a large selection of sizes that allows them to be used in everything from a small, 30-cm (12-inch)-long nano aquarium up to a huge aquarium that is more than a meter (3 feet) deep, which makes for a very attractive feature of *unzan-seki*.

The sizes of natural stones were somewhat limited in the past. A large stone is heavy and is difficult to transport or use in a layout. Since *unzan-seki* are porous lava rocks, they are relatively light for their sizes. This can be an advantage when producing a layout. Even if you have a large-enough *hakkai-seki* (a river stone) to be used as an *oyaishi* (the primary stone) in a meter (3-feet)-deep aquarium, it would be useless for a layout unless you can lift it into the aquarium.

■ The arrangement of these aquatic plants can add a sense of depth to an *iwagumi* layout. The red coloration of red tetras contrasts well against the vivid green of the aquatic plants.

Using *Unzan-seki* in an *Iwagumi* Layout

The layout in this article is a basic *iwagumi* layout in a standard 90-cm (35-inch) aquarium produced with three stones of varying sizes, which is typical for a basic *iwagumi* layout. The largest *oyaishi* is three times the size of the smallest stone. A *fuku-seki*, the secondary stone, and *soeishi*, the accompanying stone, should be in a two-

Takashi Amano

■ The appearance of the layout with an arrangement of *unzan-seki*; the stones were arranged according to the basic principle using three *unzan-seki* in various sizes.

Takashi Amano

■ A *wabi-kusa* disc of short hair grass that was placed in the depression of an *unzan-seki* as an accent.

Takashi Amano

■ The appearance of the layout right after planting; plants are arranged carefully so as not to destroy the implied water flow.

DATA

Aquarium: Cube Garden W90 x D45 x H45 cm
Lighting: Solar I (NAG-150W-Green) x 2 units, turned on for 10 hours per day
Filter: Super Jet Filter ES-600 (Bio Rio, NA Carbon)
Substrate: Aqua Soil Amazonia, Power Sand Special M, Bacter 100, Clear Super, Penac W/for Aquarium, Penac P, Tourmaline BC
Additives: Brighty K, Green Brighty STEP2
CO_2: Pollen Glass Large 30, 3 bubbles per second via CO_2 Beetle Counter (using Tower)
Aeration: For 14 hours after the light is turned off using Lily Pipe P-4
Water Change: ⅓ once a week
Water Quality: Temperature 25°C (77°F), pH 6.8, TH 20 mg/l
Aquatic Plants (*Wabi-kusa*)**:** *Eleocharis acicularis, Glossostigma elatinoides, Echinodorus tenellus, E. quadricostatus, Eleocharis* sp.
Fish/Invertebrates: *Hyphessobrycon amandae, 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.]

to-one balance. Their sizes must also be appropriate for the size of the aquarium. The three *unzan-seki* were selected while keeping this in mind.

Since *unzan-seki* have quite irregular, natural shapes, a layout looks good with just one stone placed in an aquarium. However, a full-fledged *iwagumi* layout can be created by placing three of them in an aquarium in a balanced manner. In this layout, the substrate was established using sand fortified with organic nutrients for the base and a nutritive soil. Then, the soil was mounded from the left rear of the aquarium after arranging the three *unzan-seki*. Doing so rendered a sense of unity to the *unzan-seki* and, at the same time, created the impression of a water flow that runs from left to right in the aquarium. As a matter of fact, the positions, angles, and tilts of the *unzan-seki* were established by envisioning the water flow beforehand. The stone placement and soil-mounding techniques are basic ones for an *iwagumi* layout that can be applied universally, regardless of the types of stones.

Aquatic plants were arranged carefully so as not to spoil the implied flow of water. Long hair grass was planted in the background, and *Echinodorus quadricostatus* and *E. tenellus* were placed in front of it. These plants were planted toward the left side of the aquarium where the soil was mounded, and an open space was created in the right side of the aquarium. Additionally, *Glossostigma* was planted in the foreground. Arranging the plants in this manner produced an impression that the open space extended toward the right side without spoiling the impression of the water flow created by the arrangement of the stones and soil mounding.

Another key point for planting in this layout is the short hair grass planted in the *unzan-seki*. The powder type of the nutritive soil substrate was poured into the depressions of the *unzan-seki*, and the *wabi-kusa* discs of short hair grass were placed in the depression. A nutrient-rich substrate is essential for growing healthy short hair grass. The addition of the powder substrate made it possible to grow the plant in the depression of the stones. It is a technique applicable only to *unzan-seki*. In addition to short hair grass, Australian dwarf *Hydrocotyle* and *Hygrophila pinnatifida* can also be grown in the depression of *unzan-seki*. Adding a new method of expression like this can give a basic *iwagumi* layout a renewed impression.

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■ Fairy cichlid (*Neolamprologus brichardi*).

Steve Edie

the fairy cichlids of lake tanganyika

mike hellweg

The cichlid fishes of Lake Tanganyika are incredibly popular in the hobby today. They range from the smallest cichlid species in the world, the easy-to-keep, colony-breeding shell-dweller *Neolamprologus multifasciatus*, to the massive, challenging, largest cichlid in the world, *Boulengerochromis microlepis*. Everyone from new hobbyists to advanced breeders can find something that both interests and challenges them. Many hobbyists spend their entire hobby on one species, such as *Cyphotilapia frontosa* or the various *Tropheus* spp., while others search out each new species or variant as it becomes available. One of the staples of the hobby for nearly four decades has been the beautiful group of fish known as the fairy cichlids, or the *Neolamprologus brichardi* complex.

The members of the brichardi complex are found in every rocky habitat in the lake, where they are usually found in water from about 15 feet deep to around 75 feet deep. They have become masters of this habitat, evolving a unique cooperative behavior that allows them to successfully colonize these rocky homes despite the large number of predators that lurk both in the crevices and in the open water.

Fairy cichlids are generally not spectacularly colored, but each variant or species has its own pattern (or lack thereof in some species) of blue, black, and yellow facial bars and/or lines. The general body color is usually a shade of olive to grayish brown, often with patterning on the scales. The eyes are usually bright blue. They get their common name "fairy cichlids" from

the extensions of the outer rays on their fins, especially the caudal fin that forms an elongate lyretail, which can be up to two-thirds the length of the body of the fish. These extensions are usually tipped in blue or white. The dorsal and anal fins can trail back to touch the caudal fin, and the pelvic fins can sometimes reach the anal fin. The first widely distributed species, *N. brichardi*, was given the fanciful trade name "Princess of Burundi."


Steve Edie

Fairy cichlids are named for the extended outer rays on their fins.

A Bit of Science

Lake Tanganyika is vast and contains many different habitats. The rocky zones in the lake are often found around islands and are separated by miles of open water. Along the shoreline, the rocky zones are interspersed with sandy areas that can run for miles with no cover. There are areas where vast piles of snail shells have built up over the centuries. And there are areas where rivers dump into the lake.

Since the fairy cichlids are found only in the rocky zones, the populations are often geographically isolated and dispersal is rare. That means that over the generations, genetic drift has led these isolated populations in each location to become unique. Over millennia, they can become species. These species are usually found singly colonizing a specific area, but in some places, a couple species have colonized the same area and occur together without producing hybrids in the wild.

In our aquaria, they should be maintained separately because many of them will produce hybrids in captivity. Some of these hybrids will be fertile and can reproduce. This is not an ideal situation, and most hobbyists will not like getting the offspring of a hybrid cross, so it is best to maintain each species, and further each locality, in separate aquaria. If you do wind up with crosses, feel free to enjoy them in your own tank, but please do not distribute them to other hobbyists without informing them that they are aquarium variants.

There are currently nine recognized species of fairy cichlids, each with several locality variants. As always, there are lumpers and splitters who consider there to be more or fewer species. Some experts consider a few of these species to be nothing more than locality variants of other species, while others consider them all full species. In addition, it is possible that some of the other locality variants will receive full species status in the future.

I'm a hobbyist, not a scientist, so all I can do is rely upon them to tell me which species are valid. Currently, the California Academy of Sciences lists the valid species of fairy cichlids in their online *Catalog of Fishes* as *N. brichardi*, *N. crassus*, *N.*


Steve Edie

A male *N. brichardi* ensures the safety of its colony by patrolling the surrounding territory.

Steve Edie

■ Fairy cichlids form pair bonds that may last for a significant amount of time.

falcicula, *N. gracilis*, *N. marunguensis*, *N. olivaceous*, *N. pulcher*, *N. savoryi*, and *N. splendens*. Hobbyists often also find the beautiful *N. cygnus* (considered by most a variant of *N. falcicula*) and *N. daffodil* (considered a variant of *N. pulcher*) in the trade or at club auctions as full species, but neither is currently recognized as a separate species.

Strategy for Success

The fairy cichlids are small (usually reaching 4 inches or less) cave spawners. They have an interesting colonizing strategy. In the wild, they form pair bonds that last for several reproductive episodes.

In our aquaria, this pair bond can continue throughout their reproductive life. These pairs become the center of a colony. Eggs are laid deep in the caves, and spawning usually goes unnoticed by the hobbyist. The first sign of a spawn usually consists of the female suddenly herding a group of ¼-inch young fry near the rock pile in their tank.

As this group of fry grows older, they are not chased away from the breeding area when the next group of fry appears; they are instead put to work. They take up herding and guarding positions on the perimeter of the growing colony, both inside the pile of rocks and around the outer edges. As they grow, they move a bit farther off to extend the colony's range. The next group of juveniles then takes on the immediate guard duty of the fry, and the parents patrol the entire area.

This strategy allows them to breed frequently and increase their density in an area until they have nearly complete control. In the wild, there are predators that hunt young cichlid fry in the interstices of the rocks. This guard strategy allows juveniles to help protect against these hidden predators as well as the larger predators that might approach from outside the rock pile. At some point, at least in our aquaria where there is little predation, they seem to stop breeding for a while and maintain the status quo. The juveniles might even grow into sexually mature but non-breeding adults, still guarding the outer perimeters of the colony, until one or both of the breeding pairs is no longer able to breed. These younger fish will then squabble a bit, establish a new pair, and begin to grow the colony again.

A Tank for Fairy Cichlids

The old adage is to buy as much tank as you can afford. The same goes for a tank for the *brichardi* complex. Set up as large a tank as you can. Some hobbyists like to combine them with other Tanganyikan species, such as the various *Julidochromis* species, but the fairy cichlid breeding strategy of producing overwhelming numbers with various sizes of juveniles defending the home turf will eventually force the usually tenacious julies out of their homes.

The fairy cichlids can be successfully paired with some of the open-water or sand-dwelling species in large tanks (125 gallons or larger). Otherwise, it might just be best to give in to their breeding strategy and just set up a tank for a colony of fairy cichlids. I guarantee it will be very active and very enjoyable, with constant interactions among the group and various fish popping their heads in and out of the rockwork.

I would choose a minimum of a 30-gallon tank for establishing a colony. A 55 or 75 would be even better. I've tried to set up colonies a few times in 20-longs but have not had success. I think this is just not enough room for them to feel comfortable enough to spawn.

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Steve Edie

A female fairy cichlid looks after its fry.

Set up a pile of rounded rocks or cobbles running from the base up to near the surface. The waters of Lake Tanganyika are fairly pristine, so the fish therein do not tolerate dissolved organic substances very well. Use an oversized filter for the tank, or two smaller ones. Many hobbyists combine a hang-on-back filter for mechanical and chemical filtration with a canister filter or drip filter for biological filtration. This seems to be an ideal combination and is highly recommended. Whatever type of filter you use, make sure to maintain it according to the manufacturer's directions.

Lake Tanganyika contains water that is hard and alkaline with a fairly high pH. There are several commercial substrates out there that are designed specifically for Tanganyikan cichlids, and I recommend using one of these. I have used them for many years with great success. If your local water is low in buffers, it is a good idea to add one of the commercial products that will improve the buffering capacity of your water. Replenish these with every water change. This, along with large, regular water changes, will keep the water in excellent shape for the fish and will prevent a sudden pH crash that could wipe out your entire tank in just a few hours.

Feeding

In the wild, the fairy cichlid diet is made up of tiny crustaceans—close relatives of copepods, brine shrimp, and daphnia. They feed continuously throughout the day. These three foods in frozen, freeze-dried, or live form can make up the majority of their diet in captivity. They will also do well on high-quality flake and small-pellet diets designed for carnivorous fish. Though they can be kept and bred on these diets, I find they show overall better color and produce more fry when fed on a more natural diet that includes at least some live foods replicating what they would get in the wild.

Steve Edie

Fairy cichlids have a very low tolerance for pollutants in their water, since the water in Lake Tanganyika—their native habitat—is largely pristine.

Photo by Steve Edie

■ The activity and interactions provided by fairy cichlids among rockwork make for a great display.

I feed my Tanganyikan cichlids, including adult fairy cichlids, at least once a day with newly hatched baby brine shrimp. I also usually add a feeding of frozen copepods and a feeding of live daphnia at least twice a week.

Breeding

It is close to impossible to sex fairy cichlids until they have bred, if even then. I've seen a few that I'm pretty sure are large males with a small hump on the top of their head, but I can't say for sure if this is a definite male characteristic or just a feature of full-grown fish. Oftentimes, if you move a cichlid pair to a new tank, they might settle in but never spawn again, and the fairy cichlids are no exception.

Most breeders find it best to start out with a group of juveniles and let them settle in, grow up together, and choose their own mates. Start with at least six juveniles, which will give you a near-certain mathematical chance of getting at least one pair. You'll usually get lucky and wind up with two pairs, which will both establish their own colonies at either end of the tank.

Once the pair or pairs begin spawning, the remaining fish should be removed. If they are siblings of the breeders, they will be tolerated and become part of the colony, helping to guard the perimeter. If they are not siblings of the pair, you might find them up near the surface trying to hide in a corner. It is best to remove these fish, as they will never be accepted into the colony. Once fry begin to appear, add extra food for them. Using a baster, gently add a squirt of newly hatched brine shrimp right into the fry group once a day. Add extra finely ground flakes at feeding time, too. As they grow and disperse, you can eventually start feeding them the same foods as the adults.

The colony will grow and ultimately take up as much room in the tank as it can, and there will be nowhere else for the fish to go. At this point, the pair usually stops spawning. Before you reach this point, it's a good idea to thin out the tank. Many fish breeders do this once or twice a year. One caveat I will have to add is that it is nearly impossible to remove fish from a tank with a rock pile! Once it is set up, you won't want to be tearing it down too often. But be aware that you will have to thin out the population at some point.

Remember, in the wild, predators would be removing some of the fry and juveniles. That doesn't usually happen in our aquaria. So once or twice a year, plan an afternoon to give the tank a makeover. I've found the easiest way to do so is to carefully remove the entire rock pile from the tank and then net the fish you want to remove. If you try to chase them around with a net without removing the rock pile, all you will do is spook the fish and waste your time. You might get one or two, but most will dive for the safety of the rock pile. By removing it, you will remove their hidey holes and make them much easier to catch with much less stress on both you and the fish. After removing as many fish as you feel adequate, reset the rocks in a similar arrangement. The remaining fish will figure things out on their own.

I find that most of the fairy cichlids are in high demand, and local shops usually love to get locally raised fish in trade. If you don't yet have a relationship with a local shop, it is a good idea to begin building one over time. Buy your food, supplies, and at least a few fish there, even if the prices are a bit higher than the local big box store. Drop in regularly. Say hello to the owner or the manager, even if you're not buying something that particular day. The support of a good local shop can be the difference between failure and success in the hobby, and the local shop needs you just as much as you need them.

Fantastic Fairies

The fairy cichlids of Lake Tanganyika are a fascinating group of fish with interesting social behavior. They're not like the typical cichlid that guards the fry for a short time and then lets them disperse. Instead, they build a fascinating, thriving colony that can grab your attention for hours at a time. Set up a colony tank near your television, and soon you'll find yourself watching the fish more than the TV! Even if you are lucky enough to have a fishroom full of tanks, don't forget to set aside some time to just watch the fish. After all, that's why we got into this hobby in the first place. And fairy cichlids put on a great show.

■ Morpho characin (*Poecilocharax weitzmani*).

Mark Denaro

BREEDING THE MORPHO CHARACIN

JOHN ROBERTSON

Though challenging to keep, *Poecilocharax weitzmani* is one of the most extravagantly beautiful fish you could wish to see. This characin is widespread across the western Amazon Basin from the Rio Negro to Peru and is closely related to another fascinating fish, the sail-fin characin *Crenuchus spilurus*.

P. weitzmani has several common names, but I prefer morpho. I guess the name started because someone was reminded of the stunning and luminously colored South American butterflies of the genus *Morpho*. It is an appropriate comparison, but to me, the name suggests the rapid metamorphosis that the males of this species undergo as they grow from a drab, short-finned fish into one with a jutting jaw, amazing color, and the most flamboyant finnage.

The young are slender, compressed fish with a small terminal mouth. They have a brownish body with a dark line from the operculum to caudal peduncle, and there is a suggestion of red in the normally proportioned, rounded fins. In fact, their youthful appearance is not unlike the African citharinid *Nannaethiops unitaeniatus*.

As adults, the males develop three brilliant lines along the flanks: black, red, and gold. The golden line in particular adorns huge reflective scales that gleam like pieces from a broken mirror. Between the gills, the gular membrane (the membrane around the throat) turns black as if to emphasize the amazing increase in the male's jaw size. To top it off, the dorsal and anal fins become finely spotted with red and grow into huge extended banners that flow beyond the red tail. At about 2½ inches total length, the overall impression of the alpha male is stunning.

Females remain short finned, continue to look similar to the young, and grow to about 2 inches. Both males and females are generally very slim, and the male's huge lower jaw and skinny body look incongruous.

Aquarium Care

I bought eight morpho characins, each about 1 inch in length. The only tank I had that was suitable housed a batch of four-week-old lemon tetras (½ inch each) that I had bred. I thought the morphos would eat the young lemons, but they didn't, and their behavior at first was rather like pencilfish. They ate only tiny foods, swam together in open water (but closer to the bottom than pencils), and dived for cover when disturbed.

The 30-inch tank was set up with lots of oak leaf litter, Java moss, and pure rainwater. The temperature was approximately 78° and the pH about 5.5, and there was no additional filtration or aeration. After about a month, the lemon tetras were growing fast and dominating the food, so I removed them all, and only then did the male *P. weitzmani* begin to develop. By the end of September, one male had grown from an ugly duckling into a bird of paradise, and in only a few weeks, his finnage and colors were stupendous. It turned out that I had five males and three females, but there is a hierarchy effect. The less dominant males develop lesser finnage and less striking colors than the alpha male.

Knowing that these fish breed very differently from most characins because they lay eggs in a burrow, I added a number of PVC tubes to the tank (2 inches in diameter, up to 8 inches long). The dominant male immediately took up residence in the one that was hardest to look into. That seems to be a theme. I have tried to put the tubes closer to the front glass (so that I can photograph them), but they don't use those.

Tail Wagging

Their behavior changed after the tubes were added. The males displayed to each other occasionally, but otherwise, the fish became

very shy and were seen only when food was offered. The whole group seemed to stay close to the tube that housed the dominant male. Books that say these are shoaling fish are describing juvenile behavior only.

In October, the male was seen wagging his tail frantically in the tube as if moving water over eggs, but I couldn't see any. When that stopped after a week or so, I decided to split the group and moved two males and two females to another identical setup. I was worried because the males had developed the huge lower jaw yet seemed very skinny. They continued to grow on a diet of baby brine shrimp, lobster eggs, grindal worms, small live bloodworms, and daphnia, however.

After splitting the group, a male in the second tank also developed quickly into a glorious beast about 2½ inches in total length. The other males attained varying degrees of splendor, but one specimen with male colors retained short fins almost like a female.

The fish were now so shy in both tanks that I added two pairs of *Epiplatys annulatus* as dithers to each, which seemed to help.

In late December, I noticed one male again beating his tail constantly in his tube. It was in a dark corner, but I was pretty sure there were no eggs. He began gently driving away the other males in this stage, but the females hung about more than ever. After a few days of his tail beating, I noticed that one female began to fill out. She was hardly bloated but took on a robust appearance. Perhaps the male's tail wagging is distributing pheromones telling the females that he is in good condition and ready to spawn. The fuller female posed in front of him at the tube entrance, though I never saw her enter.

Mark Denaro

■ Male morphos are known for having colorful lines that run across their flanks.

Mark Denaro

■ The combination of small size and bright lines on *P. weitzmani* make them particularly striking when they swim about in groups.

Spawning and Parental Care

The next day, I was sure they had spawned. I could hardly see the eggs in the shadows, but he was clearly attending to something with his mouth on the roof of the tube and the female was skinny again. I have rarely seen a female with that robust shape before or since.

Wriggling fry could be seen after 48 hours. The male never left the tube until the tenth day. His tail wagging diminished, but he occasionally nudged the fry mass with his head. It is interesting that in *Characoids of the World*, Jacques Gery noted that members of this group have strange cells on the top of their head (the frontal organ), which he suggested may be used in detecting prey in turbid waters. Is it possible these unique apparatus have a role in brood care? Maybe even just locating the young in a very dark hole?

I removed one or two of the other fish from the tank each day until the male was alone with his young.

On the tenth day, I removed him, as he had left the nest to eat and was still out a few hours later. I was afraid his parental instinct was diminishing. On the eleventh day, I moved the tube toward the front of the tank and my friend Paul Hards took some photos of the hanging fry.

As the days passed, the young wriggled less and seemed to be attached to the top of the tube by their head (is this the frontal organ again?). They were free swimming on the thirteenth morning (at 78°), about 6 mm long, and taking baby brine shrimp from the start. For six weeks they hid, mostly alone, in dark corners, under leaf litter, under moss, and very often in the natal tube. They don't like bright light and seem to need to be beneath cover or very close to it.

Help from an Expert

Being a child of the 1950s, I have never grown to love the Internet. I use email all day at work, but the World Wide Web seems so full of rubbish that I have kept it at arm's length. But this story of breeding fish shows the other side of the Internet

Mark Denaro

■ *P. weitzmani* may be a bit shy at times, so driftwood and other forms of decoration will prove useful.

and the amazing power it has to assist people and bring them closer together.

First was the support I received from across the Atlantic from characin expert Randy Carey. I haven't met Randy, and he doesn't know me at all. I was browsing some fish forum or other, looking for help with *Poecilocharax*, and someone wrote that I should ask Randy. So I did, and his generous response started a chain of email correspondence that charts this entire story. Randy openly told me of his difficulties with the species and the conditions he found them in when collecting on the Rio Negro, Brazil. He also gave me numerous pieces of useful advice. This included his observation that they are much happier when able to take refuge under a floating mop. Randy took the time to help a stranger.

He told me, "I was involved with receiving a shipment of 100 specimens, and they started dropping like flies until I provided several killifish mops. They would swarm under the mops for refuge, and at that point the losses stopped."

He also described catching them in their native environment in Brazil (a stream near the Rio Negro). "They were found in water that is very soft/acidic (pH in the 3s) and quite brown from tannins... in a very small stream (less than a meter [3 feet] wide) and at a deep and nearly stagnant depression within this small stream."

"About temperature—the main river near the *Poecilocharax* habitat I found was about 82°. But the small stream was under shaded canopy. I do not know the temperature of the water there, but I suspect it might have been below 80°... I am assuming the fish choose microhabitats that have almost an absence of current."

Secondly, I kept in almost daily contact with my friend and fellow fishbreeder Paul Hards. It is so easy to rattle off a couple of lines, and Paul offered constant support and good advice. In fact, on a visit to my fish house on a very snowy December day, he was the first to spot that the female was more rotund than normal and was more than usually posing at the front of the male's tube. I was extra vigilant following his visit, and the next day, I was sure they had spawned because of the female's loss of girth (the tank's dim lighting meant I could barely see into the tube). The photos of fry in the tube ten days after spawning and of the young at 37 days were taken by Paul.

Thirdly, Paul was able to find an article online by Michael Schluter, who had a very similar experience to the one I am now recounting, providing further guidance.

A Disaster and Winning a Raffle

At four weeks, the fry were still only 10 to 12 mm long but had nice round bellies, unlike the adults.

At six weeks, they survived a week without food when I went skiing in February. They were eating well and becoming bolder and very sociable, moving in groups of three and four. I fed them mainly baby brine shrimp (twice a day) and supplemented that with occasional microworms for the first few weeks and later with grindal worms, frozen lobster eggs, and live cyclops.

On Saturday, March 20th, disaster struck. I fed baby brine shrimp to the young *Poecilocharax* in the morning, and they ate normally. Then I did my normal Saturday morning water changes and left for the afternoon. At 5 p.m., I returned to find most of the young dead at the water surface. I rescued three that were gasping and removed them to their parent's tank, but two were dead by midnight. Four young *Epiplatys* in the fry tank also died, and the signs seemed to indicate poisoning.

I had changed water in the fry tank several times before without ill effect. I used the same water as I did for all my other sensitive fish—rainwater brought up to temperature. None of the other tanks suffered any bad reaction. The *Poecilocharax* water had been stored for several days in a bucket at a high level in my fishroom. I just can't explain it. I keep thinking the water was contaminated, even possibly by sabotage, but that's paranoid because no one else goes into my fishroom.

I recovered 14 dead *Poecilocharax* ranging from 15 to 17 mm long, total length. They were 68 days old since free swimming. I was devastated, but a few days later, one survivor appeared in the adjacent tank. It felt like I had won a raffle. It had mouth fungus and looked pretty sick, but it recovered and is now over 25 mm long, eating well and growing, unconcerned by the much larger adults in that tank.

Evolution?

In Romer's wonderful *Cichlid Atlas* (volume 1), he explains how the most flamboyant *Apistogramma* spp. evolve in creek habitats where they are less prone to predation and how female choice drives the development of more elaborate finnage and color. Perhaps these beautiful morpho characins developed in parallel. In tiny habitats with low risk of being eaten, the males can afford to be extravagant, and if the females choose, generation by generation, mates with the largest jaw (handy to discourage anything from entering the nest), the most wonderful colors, and splendid fins, then over the millennia, maybe what you get is a stunning species of tropical fish.

I am not sure why I have been able to breed these fish when many experts have failed. I can't say I have the magic formula. After months of reclusive behavior, hiding away in the leaf litter, the adults began to venture out again in spring. There was a second spawn in May, but none hatched. I don't know why.

Poecilocharax weitzmani is a great challenge, probably the most fascinating and beautiful fish I have had the pleasure of keeping. The frustration of losing the brood is tempered now with joy that I was able to witness such wonderful fish through their amazing life cycle. If you ever come across this species, don't be afraid to try it. You'll be in for a treat.

As an aside, isn't it wonderful that such a great fish man has such a great fish named after him?

Jack Wattley

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Outdoor Pond Basics

Lea Maddocks

A pond can make a gorgeous addition to your outdoor space.

Photo by A. Jacks/Shutterstock

Have you ever wondered about setting up a pond in your garden but didn't know where to start? There is much to consider when setting up an outdoor pond, so plan carefully. You'll need to determine what size and style (formal, natural, including water features or bridges, etc.) you might like, what fish and aquatic plants you intend to keep and if they will suit your chosen style, what level of filtration you will need, whether you'll use a liner or pre-formed pond, whether you'll use concrete or raised brick, and whether you'll dig it yourself or employ a professional to construct the pond and build paving or decking around it.

It is also critical to ensure that you have the appropriate space and budget to see your plan come to life. Also bear in mind what level of routine maintenance you're willing to commit to, as larger or more complex pond gardens will take more effort to care for. You may find that you will need to compromise on a few aspects to achieve a beautiful pond that is also functional and meets your space and budget limits.

Placement

Choosing an appropriate place for a pond is vital and will depend on several factors. A pond must be set on a level area that is not at a drainage point to avoid any contamination from garden runoff, is not over or near buried power or phone cables, is close to an electrical connection fitted with a GFCI to safely power pumps and filters, and does not have overhanging trees that may pollute the pond with fallen leaves or bird droppings and/or have potentially invasive root systems.

Ensure that the pond receives some sunlight to provide beneficial UV radiation for the animals and good plant growth, but avoid exposure to full sun all day, as this can cause algae problems and stress the fish via lack of shade, sunburn, and excessive heat. Warm water will also reduce levels of dissolved oxygen, which can cause dire problems if the pond is heavily stocked and/or under filtered. A shade cloth, wall, or eaves of the house, which keeps the pond shaded part of the day, would be ideal to remedy this issue. If the pond must be in full sun, keep the water well oxygenated with airstones or a water feature and plant heavily with broad-leaved pond plants, such as lilies and lotuses, to give the fish shade, block some sunlight, and absorb excess nutrients that might fuel algae blooms.

If you live in an area that experiences cold or snowy winters and you require your fish to overwinter in your pond, ensure that you are able to dig the pond to a depth of 3 to 4 feet and make sure this area is wide enough for your fish to swim about comfortably, even though they will be a lot less active in the cold. The water temperature at the base will be warmer than the surface layers, which are liable to freeze, and by making your pond both deep and wide, you will ensure that your fish will have a good space to overwinter with sufficient space to swim. Additionally, if your pond is likely to freeze over completely, remember to break the ice daily to allow proper gas exchange, or add a submersible heater that will keep one area free from ice. The fish will also appreciate the extra warmth.

Consider also any predators or pests in the area, including large birds, racoons, or local cats, which might seek to make a meal of your pond fish. A mesh set just below the water surface might protect your fish while still allowing plants to grow through them. Conversely, also plan for wildlife that might take up residence in your pond, such as small birds, frogs, lizards, etc., and plan protection for them if possible. Finally, make sure your pond is in a position that you find aesthetically pleasing and can easily see from around the garden or inside the house.

Lea Maddocks

■ The best location for a pond includes both shade and direct sunlight, providing fish a place for refuge during the midday heat and plants with plenty of light for growth.

Pre-Formed Ponds and Pond Liners

Once you've decided on the place, determine the size of pond that will best fit the area and what construction method you might use. Cheap and easy options include digging it out yourself and using either pre-formed ponds or pond liners, both of which stop water from escaping into the soil, soil tainting the water, and the pond losing its shape through erosion. Pre-formed ponds are extremely easy to use, as they are cut or molded into specified shapes and are ready to go. They are available in a range of shapes and sizes and are the best option for small to intermediate ponds if you wish

Kelly Nelson/Shutterstock

■ Make sure you choose a location that you find aesthetically pleasing to install the pond.

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Michael Gilroy

■ When laying out your pond, be sure to vary the depth to create an interesting and natural environment for fish.

to put in a pond yourself but are not too handy at do-it-yourself methods. Some companies may also customize them for you. The only drawbacks are that they are not available in very large or deep sizes and you cannot customize them after purchase.

If you require extra size or depth, a more customized or complex shape, or even a creek feature, consider using a pond liner. These are generally made from PVC, EPDM (ethylene propylene diene monomer), rubber, or other specific plastics made by specialty pond supply companies. PVC liners intended for ponds are usually the cheapest and most flexible, with the latter options generally being more sturdy and able to tolerate more extreme weather. When purchasing a liner, the dimensions required are generally determined as follows:

Length + (depth x 2) + 24–36 inches = length of garden pond liner

Width + (depth x 2) + 24–36 inches = width of garden pond liner

This will ensure you have enough to cover the pond, plus extra for overlapping the edges. Be generous in purchasing a liner, as it is better to have too much rather than not enough.

Installation of Pond Liners and Pre-Formed Ponds

When installing a pond using either a liner or pre-formed pond, mark out your shape with chalk, string, or a length of hose and excavate down to your desired depth and width, plus an extra foot or more on all sides to allow for padding with an underlayment, such as pool underlayment, damp sand, or even a few layers of old carpet. This will allow the pond to settle well and prevent rocks or other debris from penetrating it. If using liners, make the pond surface as large as you can to improve your stocking capabilities by creating a larger surface-area-to-volume ratio, which will increase oxygenation via natural gas exchange at the surface. If you have limited space, you can also improve oxygenation by adding airstones, a venturi line on the filter outlet, or water features that cause turbulence, such as waterfalls or fountains.

Vary the depth in the pond, as this will give a more natural and interesting environment for fish. By using long, flowing lines and avoiding small corners, you will prevent dead spots where the filtration will not reach or be effective. Allow the sides to slope gently inward or in a step-wise fashion to create one or more wide planting shelves on which to place some pond plants. Using planting shelves is a great way to plant, as you can simply leave pond plants in their pots and set them on the submerged steps where you like. This approach will instantly add some peripheral water plants and provide space that is not too deep in which to place them. Plus, you can always move the plants if need be. Indeed, keeping pond plants on sloping sides once the liner is installed is a tricky affair, and it may require some creative rockwork to hold them in place. Shelves may also prevent small landslides occurring while you dig. When using pre-formed ponds, it is better if the digging is done after purchase so you can chalk out the dimensions using the pond as a template (not inverted, as the shapes will be mirror images) and check the size as you go, using a spirit level to ensure a good fit with the base and the planting shelves, which are often built into the mold.

After excavating, clear the base and sides of rocks, sticks, roots, etc., and then lay your preferred underlayment followed by the liner or pre-formed pond. Once a pond liner is in place, fill slowly with water, adjusting any tension and folds around the base and sides as you go to assist in settling well. Use stones to help keep the shape if need be, though ensure they are relatively smooth to prevent puncture. If using a pre-formed pond, place the underlayment on the base first, put in your pond, and then back-fill the sides with wet sand, adding water to the pond to the same level as the back fill as you go so that it settles well.

For the edges, it's helpful to leave a bit of pre-formed lip above the surface so you can build up the sides a little around the pond to stop any surrounding water running into it. With pond liners, build up the edges a little first, allow some of the pond liner to overlap the surface edge, and cover with pavers, stone, etc. to keep the edges in place. Do note that if you choose to use concrete in the edging, be very careful not to allow any concrete to enter the pond, as it will leach toxins that can poison aquatic life. If in doubt, coat any concrete near the pond with a pond-safe waterproof sealant once dry to protect the pond.

Concrete Ponds

These are best for shallow, formal ponds that have definite shapes like circles, rectangles, or squares. They can look impressive with decking or paving surrounding them. Alternatively, concrete can be used for very large permanent ponds, as any design can be catered to and large numbers of fish or koi can be kept in them. For any construction using large volumes of concrete, it is strongly recommended to use a professional pond builder. If you wish to make a smaller pond and are handy or have experience in this area, plan carefully, as cracks and fractures can occur if thickness is not appropriate and concrete is unforgiving when it comes to plumbing and electrical work. Indeed, it may be best not to encase any plumbing or electrical work in the structure and to disguise any hose or cables with plants or landscaping. Advanced building techniques and concrete mixing and application are beyond the scope of this article, so consulting

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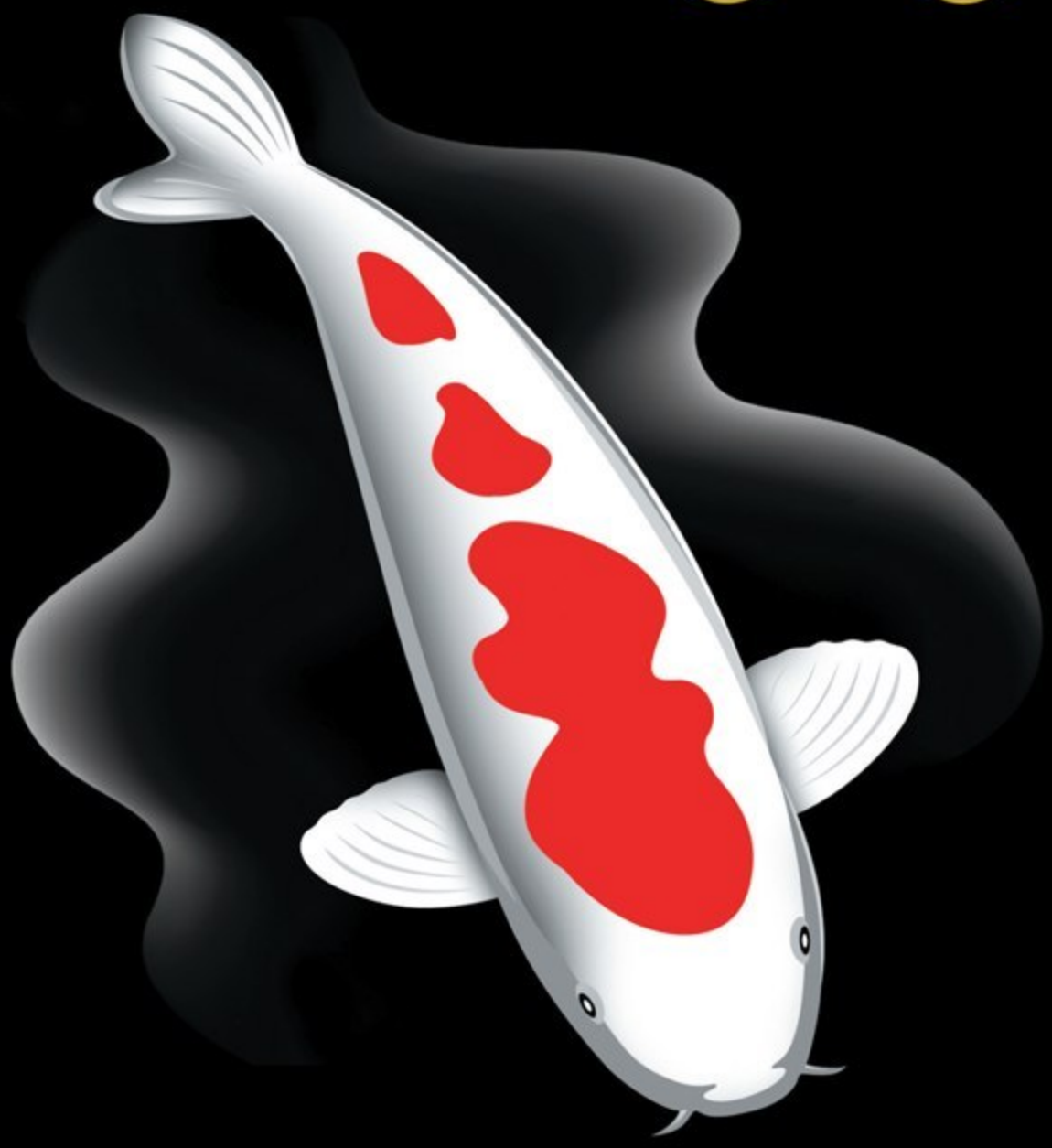

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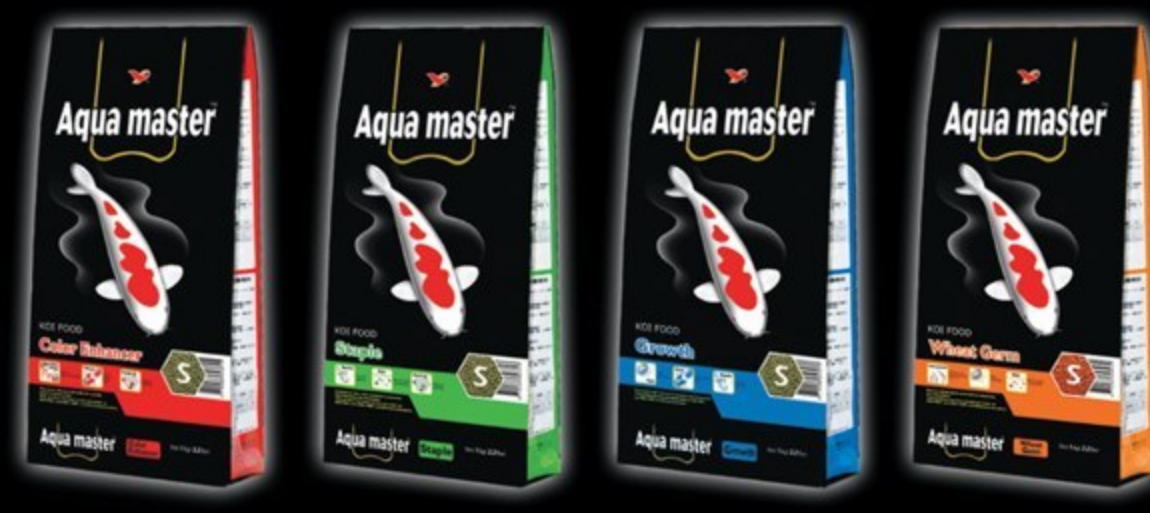

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■ Concrete ponds can look great when surrounded by paving stones.

a professional is strongly recommended if you are attempting this yourself.

Nevertheless, a few basic principles can be suggested for most smaller, do-it-yourself constructions. When using concrete, dig your pond as suggested above with an extra foot on all sides. Compact the base very well. Take care to avoid slopes over 60 degrees, as wet concrete may run or slump. Line the pond with wire mesh for reinforcement. Pour the base first and tamp down to remove trapped air, ensuring the total thickness is at least 6 inches, though thicker is always better, so err on the side of caution. Next, pour your concrete slowly up the sides. Press in another mesh layer and cover with more concrete. Use a float to give it a smooth finish. A smooth pond will also prevent injury to fish from rough patches. Finally, cover with plastic sheeting and allow to dry.

For straight sides, specific shapes, and/or planting shelves, using wooden shuttering is recommended. Leave a 6- to 8-inch gap between the shuttering and sides, also ensuring mesh is placed in the gap for reinforcement. Concrete can then be poured into this gap, followed by vibrating and/or tamping to remove bubbles. Cover with plastic sheeting and remove the sheet and shuttering when dry. Do note that there are many ways to build a concrete pond and this is but one simple method. Again, further research and consultation with local builders is advised for your project. Regardless of how your concrete pond is formed, finish the dry concrete with speciality pond sealer or pond lining (ideally both) to seal the concrete and prevent lime and other toxins from leaching into the water. A liner will last longer than most sealants and may also prevent hairline cracks to some degree.

Raised Ponds

Raised ponds can be beautiful above-ground features framed in wood, stone, slate, render, or brick, and are again best for shallow features. These can be great focal points in formal gardens, particularly with a fountain or other water feature, and are wonderful for keeping a small water garden and a few goldfish. They are not likely to be deep enough for overwintering in very cold areas, so these are best advised for warmer climates or those with an indoor aquarium for overwintering pond fish. There are numerous designs for achieving a raised pond, each with specific building issues to address that are beyond the scope of this article, so consult a professional for proper design and building purposes.

Filtration

An appropriate filtration system is a vital aspect of every pond. To determine which is right for you, consider the size of your pond, level of planting, number of livestock, and your preferred species. Koi will require much larger filters than goldfish, as they consume more food and produce more waste. Factor in the amount of plants in your pond, as these will assist in consuming nitrate. Also determine the output power you will need to ensure good water circulation. You may also want to consider choosing a filter containing a UV unit, which can assist greatly in destroying pathogens and algae cells that pass though them.

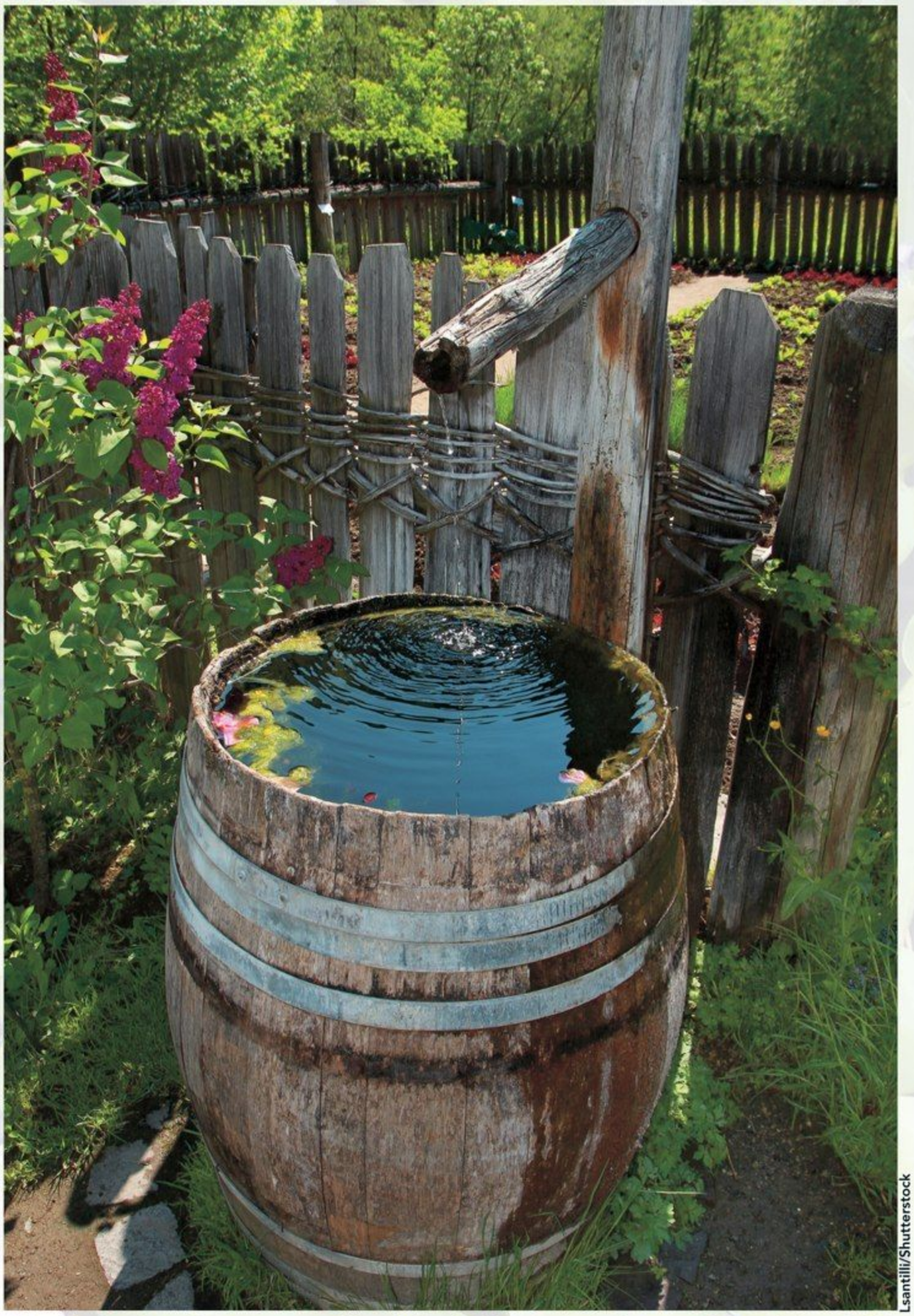
As with a home aquarium, you will need adequate mechanical, chemical, and biological filtration, so ensure your filter can handle all of these issues. For mechanical filtration, a pond skimmer can be an excellent addition to a pond that may have leaves, particulate waste, and surface debris, which require frequent removal. Regular

cleaning of cages covering intakes will also improve mechanical filtration.

Chemical filtration can be achieved by adding activated carbon to reduce dissolved organic compounds (DOCs), and granular ferric oxide (GFO) or other products can be used to remove or reduce phosphate. There are many other chemical filter pads to absorb ammonia, nitrite, and nitrate, which can be cut to size to fit most filters, or are available in bead form, which can be added in net bags to your filter. However, these products should be chiefly used during setup while cycling your filter or to correct spikes in these parameters. Consistent elevated ammonia, nitrite, or nitrate should be rectified with better filtration or reduced stocking.

Biological filtration occurs within the filter medium itself, and the amount and quality of this medium can have a vast impact on the capacity of the filter to reduce ammonia and nitrite to zero, so choose a filter that will accommodate the amount of the medium you think you will require, and choose a medium with a very high surface area to colonize with the nitrifying bacteria. Choosing a filter with a flow rate to suit your pond size is also a must. Flow rate for most pumps should be at least two to three times the capacity of the pond per hour, more if heavily stocked. Filter pumps should also be powerful enough to circulate the water to all areas of the pond, more powerful if you require water pumped up to a high point to feed a water feature. A pond supplier will be able to assist you in choosing the right fit for this scenario. Adding a venturi attachment to your outlet is also very useful in increasing aeration and improving dissolved oxygen in the pond. Incorporating a cascading water feature, like a waterfall or fountain, can be very effective at creating further oxygenation and improving aesthetics. The sight and sound of trickling water from your feature can be impressive and very soothing.

Plants will also oxygenate the water during the day. They do respire at night, however, so continue to use another aeration source in the evening. Pond plants are also very useful in absorbing nitrates, so use these lavishly, though be sure to remove any dead stems or leaves from the water surface regularly, as rotting vegetation will contribute to the biological waste load. An alternative and effective method of filtration involves pumping water through a concentrated mass of plants and roots after being passed through the mechanical filter (so larger debris can be removed first and does not decompose among the roots or stems). This allows the plants themselves to act as an effective biological filter, as they will consume nitrates, CO_2, and some trace elements, and the submerged leaves, stems, and root systems will provide a large surface area for nitrifying bacteria to colonize.



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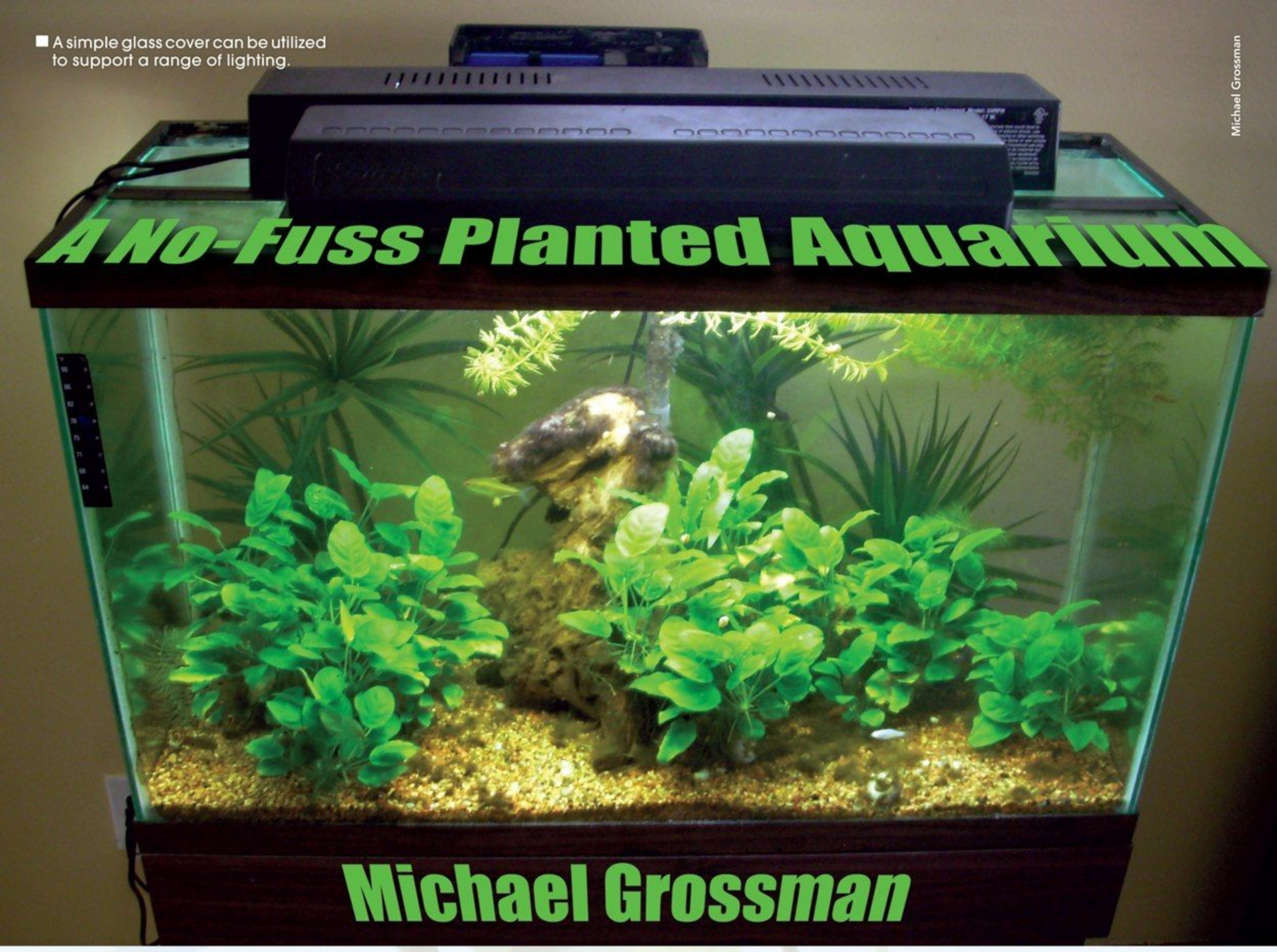
■ Small raised ponds are one possible choice for those who lack space but are interested in keeping a couple of goldfish outdoors.

There are numerous ways to filter a pond, though good circulation to all areas, zero ammonia and nitrites, and low nitrates are a sign that you have got the balance right.

Add a Pond to Your Garden

As you can see, there are myriad ponds to choose from, each with its own advantages and disadvantages. Research any type you are interested in so you can make an informed decision about which is right for you. When properly planned and built, a pond will make a fantastic addition to your home for years to come.



A simple glass cover can be utilized to support a range of lighting.

Michael Grossman

A No-Fuss Planted Aquarium

Michael Grossman

If you are a regular reader of aquarium magazines and books, you have no doubt seen stunning Nature Aquarium setups and have felt inspired. But then you take a look at everything involved in such a setup—all the high-powered lighting, exotic substrate mixtures, a chemistry set full of test kits, CO_2 injectors, fertilizers, substrate heaters, expensive pumps, and strange plants never seen at your local fish store—and your motivation wanes. You can, however, still have a reasonably lush, low-hassle, low-maintenance, low-startup-cost planted aquarium using only generic equipment, easy plants, and supplies available at big retail stores or pet shops.

This is by no means the definitive approach for a budget planted aquarium, but it is one idea for a setup easy enough to maintain that even the Big Lebowski himself could manage the upkeep. An aquarium or two does not have to become a part-time job.

Here in Florida, I am using untreated, hard well water with a pH of about 7.4 and 1 to 2 ppm of phosphate. The room temperature ranges from 80° to 83°F during the period of March to November because air conditioning is expensive. I make 20 to 30 percent partial water changes on a weekly basis.

Tank, Lighting, and Stand

First, buy the biggest aquarium you can afford and your floor can support. (If you live in a modular or mobile home, consider carefully the sobering fact that a full 55-gallon tank weighs more than 500 pounds! A few years back, I got a 55 and my trailer always seemed a bit more wobbly.) I recommend large tanks not on account of machismo but because a large body of water reacts more slowly to temperature and chemical changes, providing a more stable environment. I like to use 48-inch-long 40- and 55-gallon tanks, as this length is just right for a shop light. The 40-gallon breeder tanks are less desirable, since a 48-inch shop light hangs over a few inches on each side.

A cheap, lightweight, and simple option for an aquarium stand is wrought iron. These stands are sold fully assembled at most local fish stores. While not as colorful as a wooden stand, I find curvy wrought iron gives a minimalist, even Victorian, look to the fishroom.

To cover the aquarium, just use a simple glass cover. This allows just about any light source to fit on top of the tank so you have the option to experiment with different light sources or scavenge lights from smaller tanks you might find online or at garage sales.

Most home improvement stores and other big-box stores stock 48-inch plant and aquarium bulbs for shop lights. A shop light with fixtures for two of these fluorescent bulbs is adequate for a moderate- to low-light 55-gallon or a moderate- to high-light 40-long. For shorter tanks, you can find fluorescent grow lights in sizes that fit easily on 20- or 30-gallon long/tall tanks.

I strongly prefer long tanks because shallower water attenuates the light less. If the light is too intense, simply cut a couple of 2 x 4 boards and place them under the ends of the shop light to elevate it a little. To increase intensity, a reflector can be added (or you can even make your own). Also, since shop lights do not have an on/off switch, a timer, which would give you control over the day length, would be a good idea as well.

Filtration and Heating

Cost and convenience are the priorities, so a generic hang-on-the-back filter is the product of choice. Easily replaced, utilizing filter media available from both large retailers and fish stores, and virtually idiot proof, you really cannot go wrong with one of these filters. The only issue I have had with hang-on-the-back filters is noise. Some brands may sound like coffee grinders, while others are really as quiet as the box claims. Save the receipt; you might have to try a few different brands to find the one you like best.

For emergencies, consider buying battery-powered air pumps. Available in the fishing section of sporting goods in most retail stores and at local fish stores, these run on D-cell batteries for a long time and will help circulate and aerate your water in the event of a power outage. (This happens a lot, even in the more densely developed parts of Florida.)

A word of caution on heaters: They can and do fail. I usually have to buy new ones each winter and regularly check the temperature in my tanks when heating is in use.

Decorations and Gravel

A nutrient-rich substrate is essential and may not be available at big-box stores or even some local fish stores. Typical aquarium gravel, which is usually just little painted pebbles, is of no use for growing plants. A decent-quality substrate is the one thing you should spend some money on.

I have used a mixture of fluorite and a nutritive soil substrate complete with nitrifying bacteria for many years to successfully grow plants of the genera *Cryptocoryne*, *Anubias*, *Echinodorus*, *Aponogeton*, and *Hygrophila*. These products are much more expensive than regular gravel but are well worth it. Fluorite gravel is the color of Georgia clay, and all of the rooted plants mentioned here can be grown in it. Fluorite's main drawback is that it is very dusty. I mix in varying amounts of black nutritive substrate in order to vary the bottom color of my planted tanks. While it is not impossible to grow plants in other types of gravel, starting with nutrient-rich gravel saves you the recurring expense and hassle of putting iron supplement tablets into the gravel.

Driftwood and rocks are my preferred non-living decoration. Driftwood will stain the water at first and lower the pH somewhat as tannins come out. Rocks can also affect water chemistry. To avoid any surprises, use artificial wood ornaments and rocks. Realistic-looking plastic rocks and wood, while pricey, are a one-time expense and will eliminate potentially costly water chemistry problems later on. In addition, hollow plastic displaces less water than real stone or wood, leaving more volume for fish. (I have even observed coralline algae being fooled into growing on a plastic rock in my marine tank!)

■ *Anubias barteri* var. "nana" is a popular choice for planted tanks.

■ If more intense lighting is required, you can add a reflector to the setup.

Plants

Plants are of course the main feature, whatever your fish tank budget. All of the plants discussed I have found at both big-box retail stores and local fish stores. All of them are relatively inexpensive, and several are even obtainable for free in local rivers (be sure to check your local laws before attempting to collect any type of aquatic plants). All of the plants below have done just fine growing in fluorite without high-intensity lighting, fertilizers, or CO_2 injection.

Anubias barteri

I am always pleasantly surprised by the beauty that can be attained in a tank with only one or two plant species given a little patience. The African plant *Anubias barteri* var. "nana," for example, took over the bottom of my small, poorly lit 30-gallon in about 24 months. *Anubias* are slow growers. Remember not to bury

Michael Grossman

■ Another popular variety of plant is *Cryptocoryne*, which grows moderately and does not require extensive lighting.

the rhizome. Just anchor the rhizome to a rock or a driftwood piece near the bottom of the tank so it can send roots into the gravel.

Most *Anubias* varieties look very similar. *Anubias barteri* var. "barteri," which grows twice as tall as *Anubias barteri* var. "nana," is also an easy *Anubias*. Avoid the taller *Anubias* species because they are much more difficult to care for than *Anubias barteri* varieties. Other *Anubias* also tend to be rarer and more expensive, so it will probably be easier to find *A. barteri*.

Hornwort (*Ceratophyllum demersum*)

Hornwort (*Ceratophyllum demersum*) is a rootless floating plant that obtains all of its nourishment from the water. Nevertheless, just for looks, some choose to plant it in the gravel. It is a fast grower, particularly if it is allowed to float at the surface close to the lights. *Ceratophyllum* can be found floating near the shore in many ponds and rivers on the East Coast of the United States, including throughout Florida.

Aponogeton spp.

To add seasonal variation to your aquascape, *Aponogeton* bulbs can be planted. *Aponogeton* retreat into their bulbs periodically and then come back. Resting periods probably correspond to the dry season in their native habitat. These plants grow tall with moderate to high light levels but get by under lower light, remaining small. The bulbs can be purchased dry in most stores. I am unsure as to the exact species of *Aponogeton*, which is probably *A. crispus*, *A. undulatus*, or *A. ulvaceus*; the package usually doesn't say.

Nymphaea Lilies

Nymphaea lilies have attractive rust-colored leaves and send lily pads up to the surface. I have not observed them ever to flower in the (uncovered) aquarium but have frequently seen them produce pink flowers above the water in ponds. *Nymphaea* bulbs are readily available.

Cryptocoryne spp.

Many species in the genus *Cryptocoryne* are also easy, slow growers, have moderate light needs, and require infrequent trimming. This stands in contrast to the Amazon sword (*Echinodorus* sp.), which has fast growth that produces many old leaves, which need to be removed to prevent detritus buildup. Although easy to grow, I gave up on *Echinodorus* because my favorite fish, the zebra loach (*Botia striata*), ruins the plant by munching on its foliage. Loaches and other omnivorous species have shown no interest in *Cryptocoryne* leaves. *Cryptocoryne* sometimes turn to mush and then slowly recover after being transplanted—a process called melting—so they are a little more difficult than *Anubias* spp.

Hygrophila polysperma

With intense light, this plant can grow very quickly, quickly enough in fact as to become a hassle to trim. With a 48-inch shop light described above on a 55- or 40-gallon tank, the growth rate will be more moderate. It is easily propagated: Trim to the desired height, strip away the leaves from the bottom of the stem, and plant the cutting. Also known as dwarf *Hygrophila*, this invasive Asian plant may not be available at your local fish stores. It can be found in ponds, ditches, and rivers in Florida. Listed by the federal government as a noxious weed, transport of this plant has been banned in some states, including Florida.

40-Gallon Breeder Shopping List

Wrought iron stand
Generic hang-on-the-back filter rated for a 30- to 60-gallon tank
Heater for a 30- to 60-gallon tank
Glass cover
48-inch shop lights
Two 48-inch plant and aquarium light bulbs
Timer
2x4 board
Two 20-pound bags of fluorite or nutritive substrate
Battery-powered air pumps (optional, for emergencies)
Reflector (optional)

Plant Shopping List

Anubias barteri var. "barteri" (taller)
Anubias barteri var. "nana" (shorter)
Cryptocoryne spp.
Hornwort (*Ceratophyllum demersum*)
Aponogeton sp. (guess which kind is in the bulb!)
Hygrophila polysperma (may be banned in your area)
Elodea sp.

Elodea sp.

Elodea, formerly known as anacharis, is a fast-growing plant that can grow roots or remain floating. Not as buoyant as *Ceratophyllum demersum*, this plant can be found growing at all levels of the aquarium. I trim it often and use the clippings for compost. Easily collected near the shores of lakes and rivers in Florida, I have also observed sail-fin mollies (*Poecilia latipinna*) nibbling on it in the Withlacoochee River.

The aquarium equipment and plants needed to set up a low-maintenance, moderate-light, well-planted aquarium can be found mostly at large retailers and at most pet shops, even those that do not specialize in fish. Some plants can even be found growing wild if you live in the southeastern US. CO_2 injection, fertilizers, and high-wattage lighting can certainly enhance plant growth but are not required. With only a very modest effort and expense, a well-planted aquarium can be purchased and maintained for years.

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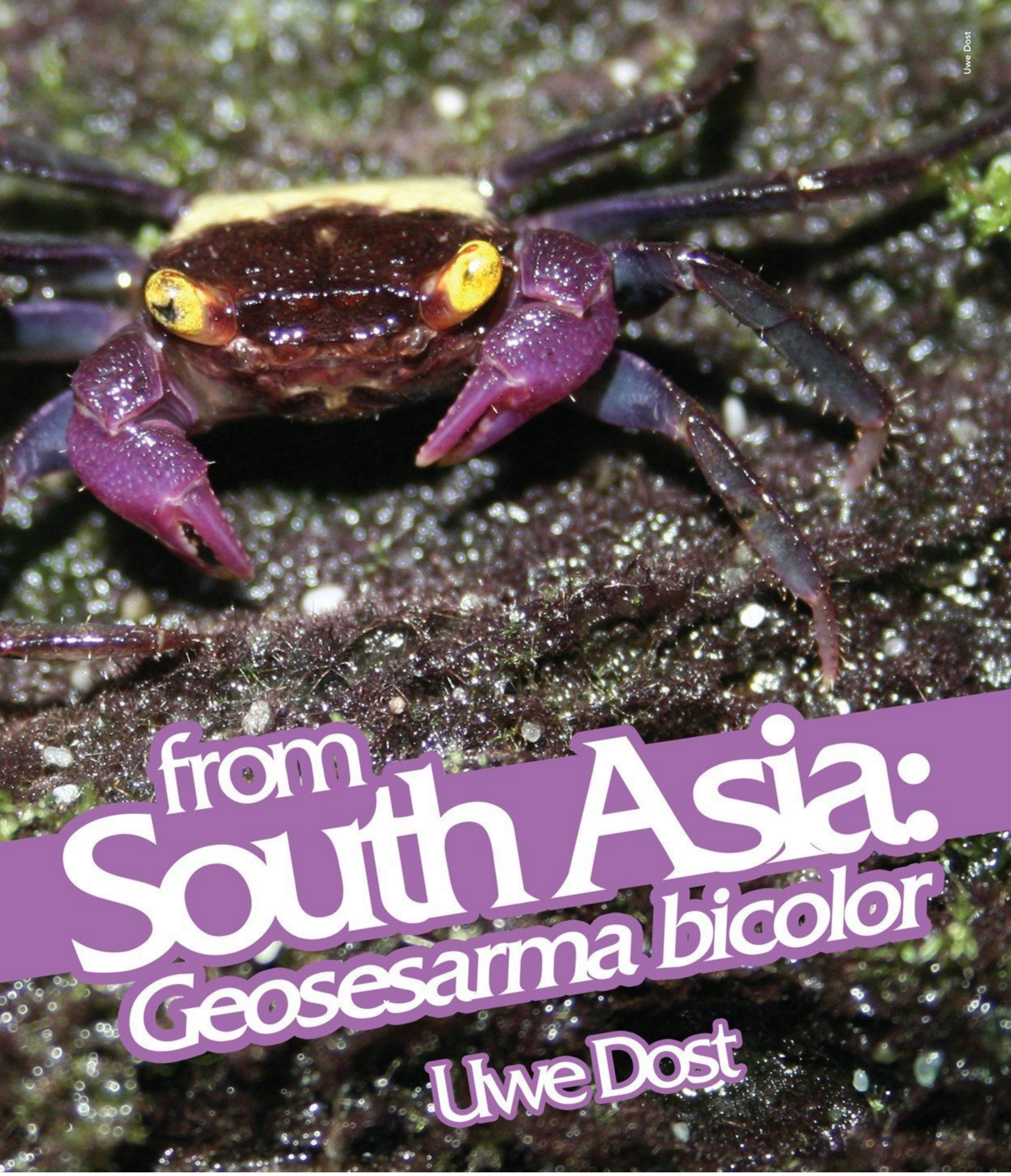
■ *Geosesarma bicolor.*

A New Crab



A **number of inverts** are currently seeing great popularity in the hobby, such as the small, colorful shrimps hailing from Asia. Color morphs of divergent shrimp species can be found in many aquatic outlets and are often purchased for use in nano tanks (a growing segment of the hobby). You can also easily see their popularity because pet stores fill their racks with magazine articles and books on decapods. In fact, over the course of this invertebrate boom, many other non-shrimp critters, such as crabs and insects, have gained recognition and have made their way into the hearts of many hobbyists.

Crabs in the Hobby

More specifically, the small crab species that colonize land, often in the genus *Geosesarma*, are highly suitable for keeping in aqua terrariums (aquariums set up so that they have both land and water features). *Geosesarma* species are widespread, inhabiting South Asia to the islands of the western Pacific. Some species are relatively agreeable and can be kept together in small groups, but there are reports of problems arising when people try to mix species. To be on the safe side, if you are planning to keep more than one individual, be sure to keep only one species together in the same tank.

Uwe Dost

■ *G. bicolor* are small, colorful crabs that can be kept in single-species groups.

The genus currently contains around 50 species, though others will surely be described or added in the coming years. Similarly, some individuals identified as members of one species are even coming under debate due to factors such as differences in reproduction. Certain species (for example, *G. hendon*) reproduce like marine crabs; they produce many small eggs that hatch into tiny zoea, which are released into the sea. After passing through a few zoea stages and one or two megalopa stages (the last stages of development before the post-larval stage), the small juvenile crabs finally move from the sea to the land. Other species (for example, *G. perracae*) have a shorter larval development period because they have larger yolk sacs, which lead to better-developed zoea. In contrast to the majority of *Geosesarma* species, these species produce only a few (up to 80) yolk-rich eggs, which are carried in the shelter of the mother's pleon (abdomen). The larvae develop entirely inside the eggshell.

Uwe Dost

■ A rainforest biotope is one option for a *Geosesarma* setup.

Geosesarma bicolor

In 2009, a new *Geosesarma* crab was imported under the nickname *G.* sp. "yellow" or "Aya." It is rumored that the first specimens were found in Singapore in a trader station, though I later discovered that they did not originate in Singapore. During my investigations, I found a 2009 article by Naruse & Jaafar about *G. aedituens*. They noted that *G. bicolor* hails from West Java.

In their native habitat, the crabs are found in or near creeks and under stones. I also found some pictures at an Indonesian exporter's website (www.aristocratama.com) that documented their search for the disco vampire crab (*G. tiomanicum*), which

could be seen turning stones around in shallow waters and at creek shores.

G. bicolor should be kept in an aqua terrarium that includes diverse areas for them to dwell. Compared to species such as *G. notophorum*, they seem to have a clear preference for aquatic areas. If you add some small snails to their tank, you may even be able to witness their hunting behavior.

A temperature of 22° to 24°C (71° to 75°F) is suitable for them, and in terms of diet, they are carnivores that prefer meaty foods, though they will take all kinds of foods that are commonly offered to fish, such as flakes, granules, and thawed frozen foods that include shrimp, fish, and bloodworms.

The land portion of their setup can be developed to reflect the rainforest—lay some leaves and pieces of bark on the soil, and include some plants (i.e., *Ficus pumila* or ground bromeliad). In regard to breeding, *G. bicolor* doesn't differ much from the other species in its genus. After a few weeks, they release up to 50 baby crabs, depending on the size of the female. If you would like to rear more than a few hatchlings, the offspring should be separated into a larger tank with a lot of hiding places to avoid cannibalism.

All in all, *G. bicolor* is another nice, tiny crab that can be finely maintained in a small aqua terrarium. They are also a practical choice for breeding.

■ Though they appear largely identical, disco vampire crabs (*G. tiomanicum*) should not be confused with *G. bicolor*.

■ *G. notophorum* share a number of qualities with *G. bicolor* but are unique in that they prefer land rather than aquatic areas.

■ In addition to having peaceful attitudes, *G. bicolor* are relatively simple to feed and breed.

Work Cited

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Tobias Li

■ To meet the demands of his growing monster fish collection, the author developed a large backyard pond totaling 13,000 gallons.

Tobias Lim Koon Li

Starting in the Fishkeeping Hobby

Fishkeeping was a hobby I did not choose as a child. It was thrust upon me by parents who felt that I needed to learn responsibility. Yet it was a lesson that I embraced and one that I passed with flying colors. In fact, the lesson was so enjoyable that I begged for more. This marked the beginning of my aquatic diary. Ten years and 170,000 YouTube views later, I reflect back on my amazing journey that transformed my dreams into reality.

Dreams Do Come True

Fishkeeping was not a hobby to brag to your friends about at school (or anywhere else for that matter). It certainly didn't make me the most popular or attractive prospect. The only attention I used to garner was from local fish shop owners and the occasional aunt or uncle—not exactly the type of attention a teenage boy craved in the budding years of his manhood.

Yet somehow, amid all the craziness of my teenage years, I found solace when buried deep in my fishkeeping obsession. I was fascinated mostly by large, predatory fish. It was the mystique of their behavior, hunting patterns, and growth that drew me deeper in my thirst for knowledge. I wanted to know absolutely everything I could about freshwater predatory fish. As a kid living on impulse, I did what I felt was right at the time: I bought them all.

Where It All Began

At the age of 12, my parents gave me my first predatory fish. His name was Tarquinius (named after a famous war general), a male flowerhorn cichlid. In 2001, these fish were the current craze. The flowerhorn cichlid is a hybrid consisting of species in different genera, although the exact mix is unknown. The product of this man-made endeavor was an immediate hit with the global fish industry. Flowerhorn cichlids are famous for their intense aggression, their striking colors, and the protruding hump at the top of their heads. The bigger the hump, the better the fish. Boys will be boys.

In addition, owing to the red hue on their bodies as well as their markings, which could be interpreted as numbers, the fish were said to bring good luck to their owners. Some people even went to the extreme of buying lottery tickets based on the numbers depicted on their fish. While this probably led to a lot of disappointment, I remember a few scarce reports of lottery winners.

All I had was a baby flowerhorn cichlid, a 10-gallon tank, and a big heart. Little did I know that this would be the start of

an obsession that would transcend social boundaries and attract praise and criticism from around the world.

I knew from the beginning that this was no ordinary fish. He was responsive like no fish I'd ever seen before. He would allow me to pet him, hand feed him, and play with him. He seemed to recognize my face and voice. His aggressive behavior allowed me to bait him into following my finger, to the joy of gleeful onlookers. What fascinated me most were his feeding patterns and the way his body would flare when he sensed food was near. The ferocity with which he would attack his food, like it could escape his 10-gallon chamber, was astonishing even when it was only inanimate pellets. Due to the level of interaction I enjoyed with Tarquinius, it was no surprise that I bonded with this fish like no other. He was strong, proud, and loyal. In a way, he truly lived up to the great war general's name.

Tobias Li

■ This overhead shot reveals the true scale of the pond and its large population.

Tobias Li

■ The pond's bridge allows visitors to get a more intimate look at the fish.

The Snowball Effect

One fish turned into two, and two into three. I was now the proud owner of three flowerhorns, all in their own 90-gallon tanks. What the fish shops always coincidently forget to tell you is that these predators grow large! Flowerhorns commonly grow to over a foot in length. Sadly, flowerhorns today barely attain that sort of size due to inbreeding and allowing smaller and smaller fish to breed. By now, my obsession had grown along with the fish I kept. These fish were eating machines. From frogs to baby carp and even worms, no animal was safe (note: I do not feed any live animals to my fish anymore). I looked forward to every feeding like it was my last.

My obsession with large predatory fish led me to the Asian arowana. These fish are commonly known as dragonfish due to their elongated bodies and monstrous jaws. Chinese people believe that the dragon symbolizes strength, prosperity, and luck. I used this as justification to convince my superstitious Asian parents into investing in a $1,000 fish, which was guaranteed to bring them more money in return. I still can't believe I won that argument.

As it turned out, first-grade red Asian arowanas grow much larger than flowerhorns (attaining lengths of 90 cm [35 inches]). Therefore, I was forced to invest in a 180-gallon fish tank, which would last him a few years. Correction: I was forced to convince my parents to invest in a larger tank that would last him a few years. My arowana (who was creatively named "Mr. Arowana") was every bit as wonderful as my flowerhorns. He fed aggressively and could retract his jaws in a manner similar to a snake or alligator. It was fascinating to watch this fish hunt and eat. My experiences could be compared to enjoying documentaries in the comfort of my fish tanks. Unlike flowerhorns, Asian arowanas lived well with tankmates. With this in mind, I already had my eyes set on the next fish, and the next, and the next.

Before I knew it, my house was literally overrun with fish tanks. To the best of my memory, I can recall having over 20 fish tanks in my house, most of which were 180-gallon, 4-foot tanks. By now, I had accumulated a wide array of freshwater predatory fish. These consisted of the giant snakehead (*Channa micropeltes*), red-tail catfish (*Phractocephalus hemioliopterus*), and tiger shovelnose catfish (*Pseudoplatystoma fasciatum*). It is safe to assume that I spent the better part of my teenage years washing fish tanks and nurturing my future monsters.

Tobias Li

■ Rich with diversity, the pond includes fish ranging from arowana to pacu.

At this point in time, my fishkeeping hobby was private and individual. Nobody truly knew about the existence of my budding collection except for close friends and family. Of course, I am forever grateful to my parents for supporting my expensive passion with little or no chance for monetary returns. That is what economists would call a bad investment. I also promised my parents that I would sell my fish for higher returns. This, of course, resulted in the accumulation of bad debts. I owe all of my fish-related success to the support of my family through the crucial growth years.

Giant Red-Tail Mistake

I am ashamed to admit that when I purchased my first pair of red-tail catfish eight years ago, I was oblivious to the monstrous size they could reach (the current world record stands at 51½ kilograms [about 114 pounds]). This stresses the point that people should research their pets before they make lifetime commitments to them! Being young and impulsive, all I cared about was their immense size, voracious appetite, and even larger personality. Red-tail catfish satisfy that criteria better than any fish I have ever owned, which is why they remain my favorite fish to this day. Little did I know that my mistake would be the worst and best part of my fishkeeping hobby.

When my red-tail catfish (conveniently named "Mr. C") outgrew my Asian red arowana community tank, I knew something had to be done. He was at risk of being stunted or, worse, devouring my arowana worth thousands of dollars! Back then, a pond was not an option. We were in the process of selling our house and finding a new one. Thankfully, my local fish shop volunteered to keep my red-tail catfish in their koi pond for a small fee until I was ready to take him back. The deal was too good to be true—and like the cliché goes, it *was* too good to be true. My lack of experience showed when the mention of koi and red-tail catfish in the same sentence did not ring any warning bells.

Note to the reader: A red-tail catfish can swallow fish of similar size. The only problem is that they do not always survive this indulgence. I got the phone call at 2:30 p.m. after badminton training. My fishkeeper's wife was in hysterics. She informed me that my fish had swallowed one of her koi and both fish had suffocated to death by the time they were found. I quickly went to her fish shop in the hope that it was all a mistake and my prized fish was still alive. She took the stiff body out of the freezer to prove to me that she had not given the fish away to another customer. I was traumatized. Seeing such a magnificent animal's life wasted on such a rookie mistake made me sick to my stomach. I remember storming out of the fish shop angry at myself for allowing this

Tobias Li

■ Measuring over 47 inches, these red-tail catfish are two of the largest fish kept by the author.

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Tobias Li

■ A pleco manages to find a spot for itself among the pond's traffic.

to happen. At that moment, I vowed not to make the same mistake again. It was a hard lesson learned, but one that made me a far better fishkeeper than I would have been.

Coincidently, my other red-tail catfish were starting to outgrow their 180-gallon fish tank. It was no surprise that I refused to send them to my local fish shop for fear of history repeating itself. After much deliberation and convincing, my parents agreed to invest in a pond for our new house. The timing was perfect because we were in the midst of building the new house.

Success with a Pond

My first pond was around 5,000 gallons. The only fish I put in there were my red-tail catfish pair, royal clown knifefish pair, and tiger shovelnose catfish pair. Shortly after I put these fish in the pond, I started to notice exponential growth and vigor! The fish were active, hungry, and healthy. I am proud to say that my fish have barely been sick for the past ten years. This change convinced me further that large freshwater predators are made for large ponds or best left in the wild. It is close to impossible for them to reach their full potential in normal fish tanks.

One day, I was sitting by my pond hand feeding my catfish dead fish from the markets. My back was turned to my largest red-tail catfish while I was feeding the other. Suddenly, out of nowhere, I felt a huge tug on my shirt and fell back first into my pond. I was flabbergasted. I had no idea how powerful my fish had become. I stared down at my fish and noticed just how large they were.

My Current Stocking List

- **Alligator gar** (97 cm [38 inches])
- **Royal clown knifefish** (90 cm [35 inches])
- **Red-tail catfish** (over 120 cm [47 inches])
- **Tiger shovelnose catfish** (90 cm [35 inches])
- **Red-tail catfish/tiger shovelnose catfish hybrid** (90 cm [35 inches])
- **Pacu** (75 cm [30 inches])
- ***Arapaima gigas*** (110 cm [43 inches])
- **South American silver arowana** (120 cm [47 inches])
- **Australian Jardini arowana** (65 cm [26 inches])
- **Asian green arowana** (56 cm [22 inches])
- **Paroon shark** (Over 1 meter [3 feet])
- **Exotic koi** (Kohaku, Benigoi, and Tancho)
- **Plecos** (38 cm [15 inches])
- **Fly River turtle** (56 cm [22 inches])
- **African tigerfish** (25 cm [10 inches])
- **Giant gourami**
- **Tilapia** (58 cm [23 inches])
- **Lemon barb**

That one incident convinced me that I had something special that I needed to share with the world. Documenting my fish at YouTube or tropical fish forums never truly occurred to me until I discovered MonsterFishKeepers.com. Going by the alias "TLkmDN," I started documenting pictures and videos of my fish to share and learn from the experiences of others. My unusually large collection of predators garnered a fair amount of attention on forums. One thread documenting my first attempt at keeping an *Arapaima gigas* has accumulated over 45,000 views alone.

Similarly, my success on YouTube wasn't trailing far behind. Before I knew it, I had accumulated 50,000 total views just through simple documentaries that I filmed with a poor-quality camera and no video editing. My fish spoke for themselves. Over the recent years, my fish have only become more famous. Now people send me emails everyday regarding fish-related problems or requests for new videos. It humbles me when I reflect back to when I was that young, excited kid asking all those same questions to older mentors on tropical fish forums. It gives me a sense of pride knowing I can give back to the fish community by answering questions through the documentation of my fishkeeping experiences.

Present Day

Ten years into my aquatic obsession, I am the proud owner of some of the largest, most exotic freshwater fish—all in my backyard! My pond was subsequently upgraded in size (to 13,000 gallons) and filtration in order to accommodate my growing collection of fish. Success on avenues such as YouTube (over 170,000 total views) and Facebook have inspired me to share my story with the wider fish community in the hope of inspiring the belief that dreams really do come true.

Final Message

As can be seen in the sidebar, my fish come from all over the world. They range from my largest red-tail catfish to my baby African tigerfish at 25 cm (10 inches) in length. Specifically, my red-tail catfish and largest South American silver arowana are among the largest of their kind that I have ever seen in captivity (over 120 cm [47 inches] in length).

These fish have garnered the most Internet attention, attracting thousands of views and questions on my YouTube videos. It is my hope that through my aquatic diary entries, I am able to document and share my experiences keeping each spectacular species from the moment they were babies to the present, where most of them can be considered household monstrosities. I aim to share my mistakes and achievements, which will hopefully make us all better fishkeepers.

■ Sexy shrimp (*Thor amboinensis*).

Richard Aspinall

KEEPING SEXY SHRIMP

RICHARD ASPINALL

Keeping a successful marine nano tank has been getting easier for years, and the task has become a realistic prospect for just about all aquarists with a modicum of skill. Many major and well-respected manufacturers also offer systemized plug-and-play tanks that are ideal for eager buyers looking for an easy way into the hobby or for existing hobbyists looking for an extra system to set on a desk or in a another room away from their main system.

Small tanks have also become simpler to manage and care for, as manufacturers have developed ranges of equipment specifically for nano and even pico systems. Small hang-on skimmers and nano-sized yet fully reef-specced lighting units are allowing hobbyists to create some spectacular reefscapes that are as attractive and successful as large, traditional systems.

Nano Considerations

When stocking nano systems, the issues of water quality are, as they should be, at the forefront of our minds, as the reduced water volume significantly limits the dilution of organic wastes (the usual suspects of ammonia, nitrite, nitrate, and phosphates). Smaller water volumes also suffer from decreased resistance to change compared to larger volumes. Temperature fluctuations and equipment failure are two of the main factors to guard against with nano systems, and these may become an issue and require action far quicker than a more buffered, average-sized system. A small tank in a hot room will overheat very quickly compared to a large one, for example.

Choosing inhabitants for a nano tank requires a good deal of planning and forethought. For many of the very smallest systems, simply maintaining a mix of hardy corals and perhaps some macro algae, such as *Halimeda*, is advised. Minimizing nutrient input through judicious feeding will keep water quality high and reduce the need for major maintenance and large water changes. Some corals that are known to produce toxins or large stinging sweeper tentacles should also be excluded to reduce the effects of allelopathy and outright coral warfare.

The limited space available to the aquarist can also increase the risk of territorial disputes between any potential motile tankmates, so even more consideration must be given to choosing the tank's

Richard Aspinall

■ *T. amboinensis* are excellent inverts for smaller tanks in the 2- to 10-gallon range.

WhitcombeRD/Shutterstock

■ The alias of sexy shrimp is based on the swaying motions they perform with their backsides.

Orlandin/Shutterstock

■ *T. amboinensis* get along well in groups and are compatible with some other shrimp species.

inhabitants if you are thinking of including inverts or fishes that aren't going to stay where you put them.

For the majority of aquarists with nano systems of 2 or more gallons, thoughts are going to turn to the stocking of small crustaceans. In my opinion, there is no better candidate for a nano tank than the sexy shrimp.

Sexy Shrimp Basics

The sexy shrimp (*Thor amboinensis*) is one of the most charming, engaging, and downright cute invertebrates available. It also makes an excellent aquarium animal. In the wild, it is found throughout the tropics, typically among the tentacles of anemones such as *Stichodactyla helianthus and S. gigantea,* the bubble-tip anemone (*Entacmaea quadricolor*), several *Heteractis* species such as *H. magnifica*, and the giant condy (*Condylactis gigantea*). The shrimp's size does not exceed more than 1¼ inches, which means it is often overlooked by divers, researchers, and collectors alike.

As with other small shrimps, such as *Periclimenes*, the sexy shrimp gains protection from the hard-to-approach anemone and also appears to perform a cleaning service in return, helping keep the anemone free of detritus. It has been widely reported that the shrimp will feed on the anemone's mucus and even its tentacle tips, though this seems to be a non-issue for the host, which can cope with the level of grazing.

Keeping Sexy Shrimp

Sexy shrimps will host with most anemones in the aquarium, but they are not tolerated by clownfish that have chosen the anemone as a host—the fish may kill and consume a sexy shrimp looking for a host. If an anemone is not present in the aquarium, the shrimps may try to host on larger corals. I've had them spend time within the polyps of Duncan's coral (*Duncanopsammia axifuga*), and they are known to adopt green star polyps (*Pachyclavularia* sp.), clove polyps (*Clavularia* sp.), and even mushrooms (*Discosoma* sp.). Normally this will not be an issue, but if the shrimps aren't well fed, they may decide to predate on their hosts, which will cause a lack of polyp extension or even death of individual polyps or the entire colony. Sexy shrimps have also been witnessed eating zoanthids, so they are reef-safe only if well fed.

Richard Aspinall

■ In the wild, sexy shrimps can commonly be found living among anemones, which they clean in return for protection.

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■ Sexy shrimps are relatively bold, spending most of their time out in the open rather than in seclusion.

Looking After Your Sexy Shrimp

Sexy shrimps don't need complicated diets; they are by nature omnivores and in captivity will scavenge for meaty foods like mysis, shredded clam, and so forth. They will also take some algae-based products, such as nori. In a tank with more active tankmates, you may need to target feed them. Small pellets are particularly useful if you use a pipette.

Another joy of sexy shrimps is that they are comfortable living in groups. This is indeed advised, and they should be kept in groups of three or more. It is in this situation that their sexy epithet is earned, as they wave their backsides from side to side.

As noted, they will thrive in small systems from 2 to 10 gallons with an aquascape of live rock, replete with the usual nooks and crannies. Though in most cases, the shrimps will be quite visible and not spend their time hiding. Best of all, they are active during the day and not reclusive like some of their larger cousins, such as the blood shrimp (*Lysmata debelius*).

Breeding

At present, just about all the sexy shrimps that enter the market are wild caught. They are common and widespread, and captive breeding isn't an economically viable proposition compared to natural sourcing, but don't let that put you off—breeding them is apparently not a difficult proposition.

These shrimps are sexually dimorphic. That is, the sexes have different shapes and features. The females are noticeably larger than males and have a broken strip across their back and tail, whereas the males do not. I won't go into how to raise the fry in this article (it's something I have no personal experience with), but it can be done in a dedicated hatchery where the free-swimming larvae can be kept in suspension and not removed by filtering. Newly hatched larvae are capable of eating *Artemia* nauplii and will molt frequently as they mature. Some excellent directions are given by several sources online, with sexyshrimp.com being one of the best I've found.

If, like most aquarists, you do not have the time or inclination to breed the shrimps, you will be content in allowing the fry to enter the water column as zooplankton for consumption by corals and fish. Fish that rely on high-nutrient-value zooplankton, such as anthias, will relish this occasional treat.

Tankmates

Small ornamental shrimps are always going to be perfect pieces of snack-sized protein for certain fishes, such as predatory wrasses, dottybacks, basslets, groupers, and some large angels, but this really isn't an issue if you're keeping sexy shrimps in a nano tank, which is unlikely to have any large predatory fish and is more likely to use small fishes, such as yellow clown or neon gobies. Of course, if you add the shrimps before any fish, you will further reduce the risk of your shrimps getting eaten.

Sexy shrimps will likely get along with other shrimp species, but they will be killed by the quarrelsome coral banded shrimp (*Stenopus hispidus*). *T. amboinensis* is very unlikely to annoy other motile species.

A Perfect Nano Resident

All in all, the sexy shrimp is a perfect candidate for a nano tank. It is both colorful and enjoyable to watch as it shakes its booty, and the species is a very, very amiable companion.

Valerio Zupo

Interzoo 2012

Not Your Typical Fish Show

■ From epic marine tanks to novel technologies and newfound species, Interzoo 2012 had plenty in store for showgoers.

Valerio Zupo, PhD

Interzoo, the biannual fair dedicated to the world of pets, was an even larger success this year than in previous years. It was full of astounding aquariums and all kinds of gorgeous accessories for aquarists. As usual, it was held in Nuremberg, Germany, from May 16–20. Eleven pavilions were stuffed with thousands of products presented by producers from all countries of the world, and it was practically impossible to visit them all.

Lighting Trends

One of the most evident trends of the fair this year was LED lighting. LEDs are certainly not a new concept, having been on display in previous shows, but the attention given to them this year was obvious based on their craftsmanship and features. Advances in the technology were clearly evident since the last show. The best fixtures are elegant, run cold, consume less energy, and provide a high-quality radiation

spectrum. You can easily see that the light produced is naturalistic. Sometimes, they can even make you feel as though you are diving on a coral reef!

Some of them are programmable, allowing you to connect the fixture to your laptop using a USB cable and define time and spectrum to coinicide with any hour of the day. This allows you to provide soft, bluish radiation at sunrise and warm, reddish radiation at sunset, with high Kelvin temperatures at noon. Forget the old methods for simulating daily light variations! Given the long life of these lamps, it is probably a better deal to buy high-quality fixtures.

Monitoring the Aquarium

LED lamps were not the only interesting electronics. For instance, several brands offered multiple measurement probes for collecting continuous data on the pH, temperature, ammonia, and light spectrum of your aquarium. These can also be connected to a computer, allowing the user to share data with other hobbyists. And all of this top-quality technology comes at an affordable price.

Food Trends

What about fish and invertebrate foods? More dry foods were on display, and several of them contained glucans and probiotics to guarantee the health of fish by stimulating their immune system. The most interesting news was in the field of live foods, however. Many laboratories are working on them and I cannot discuss them all, but one definitely requires mention: an *Artemia* cyst separator based on magnetism! Everybody knows how tricky it can be to separate *Artemia* cysts from nauplii using their tendency to gravitate toward light. In particular, some small strains show very little activity toward light, and scarcely floating cysts are very difficult to manage.

With this new product, the cysts of *Artemia* are charged with a slight amount of static electricity (with no addition of metals or poisonous compounds), and they may be normally hatched in any aerated container. When the nauplii start to swim, you simply need to move the suspension in a special beaker with a big magnet on the bottom. In a few minutes, all of the cysts will be firmly attached to the bottom while the nauplii will be freely available on the surface. This is as easy as drinking a beaker of water—without cysts, please!

Valerio Zupo

■ Large bowfronts offered outstanding views of fish and plant life.

Valerio Zupo

■ Some manufacturers displayed their goods in smaller but very effective setups.

There were also a couple of interesting food products. One was a small bottle of immune system protectors, vitamins, and other important additions that could be sprayed on foods, boosting their quality of nutrition.

The excellence of animal nutrition goes beyond good foods, however. Several new feeders and feeding devices were offered, one of which was a new automatic feeder featuring innovative mechanics. The food reservoir in this product is protected by an effective rubber seal that is opened only when the food is administered. As a result, the feeder (which was shown inside a humidified tank) was still serving doses of dry foods.

Great Tank Setups

We enjoyed hundreds of great setups in each pavilion, both for tropical freshwater and marine environments. This was no surprise, as modern aquarium hobbyists care a lot about the aesthetics of aquariums. In fact, there were experts giving aquascaping lessons every day for both pet shop owners and dealers.

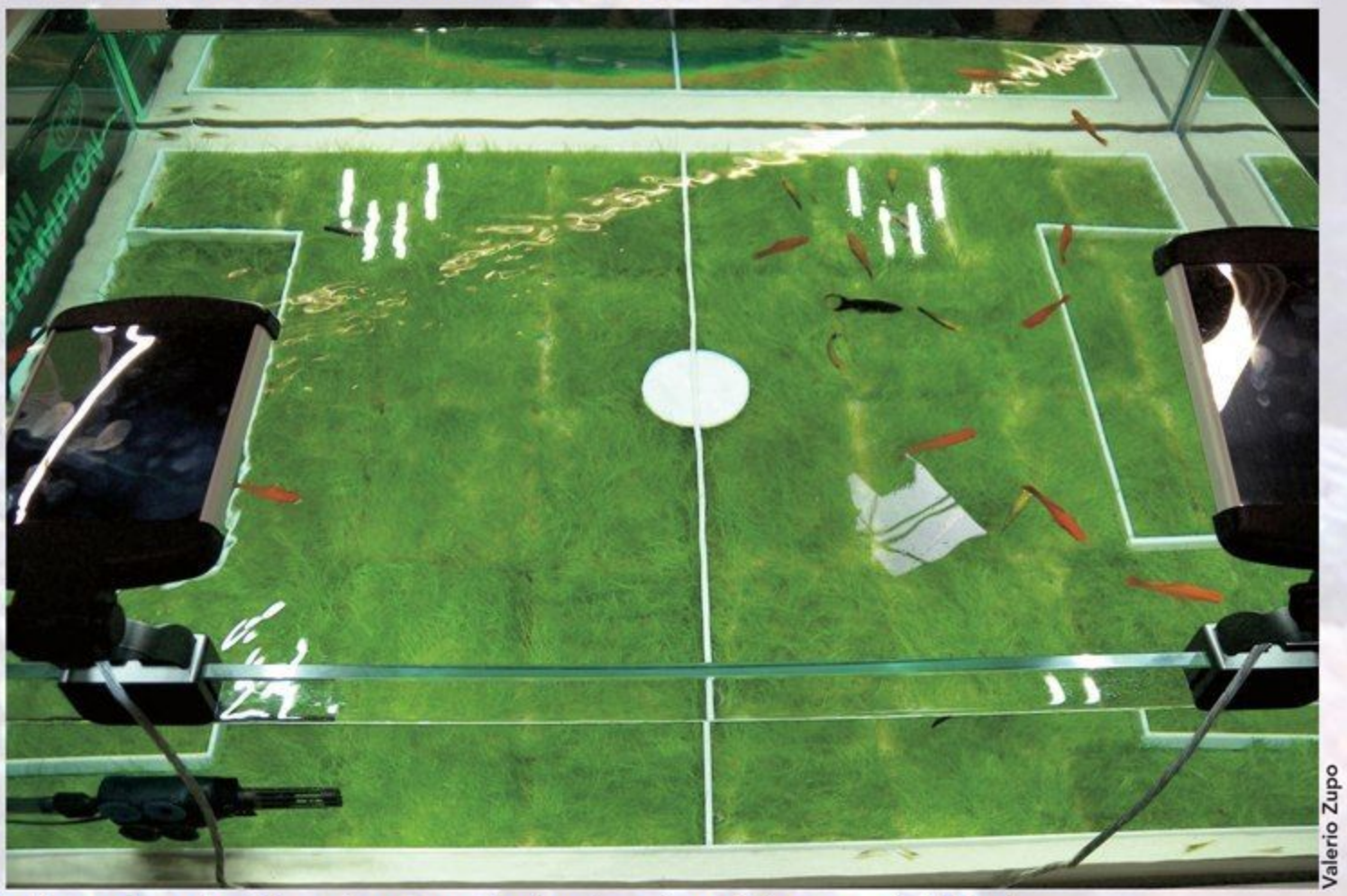
Among the true novelties on display were jellyfish aquariums. Various manufacturers exhibited aquariums with medusas, and some of them were displayed in special tanks crafted especially for them. In the coming months, you will probably find some of these circular medusa tanks equipped with filters and pumps and dedicated to the culture of medusas.

There were also a number of amusing toy aquariums, including one that resembled a soccer field. While certainly unconventional, they were designed well enough to keep the fish in good health. Some might argue that such designs are a bit of a stretch, but everybody has different tastes—especially younger aquarists, who would definitely be entertained by such creations. It is nice that they can start their hobby off with something that not only sparks their curiosity but also respects the needs of plants and animals.

Not surprisingly, the prevailing trend of small tanks was greatly showcased. These included small shrimp setups and tiny, well-equipped zen tanks suitable for those who lack space for larger setups at home. In contrast, there were also huge aquariums that could adapt to any home environment. Most of them featured an excellent acrylic surface covering both the tank top and stand. These contain all the necessary equipment to ensure maximum efficiency, stability, control, and easy management. A large tank like this may cost about $4,000,

Valerio Zupo

■ Medusa jellyfish were on display in specially crafted tanks.



Valerio Zupo

■ A number of quirky setups were featured, such as this soccer field tank.

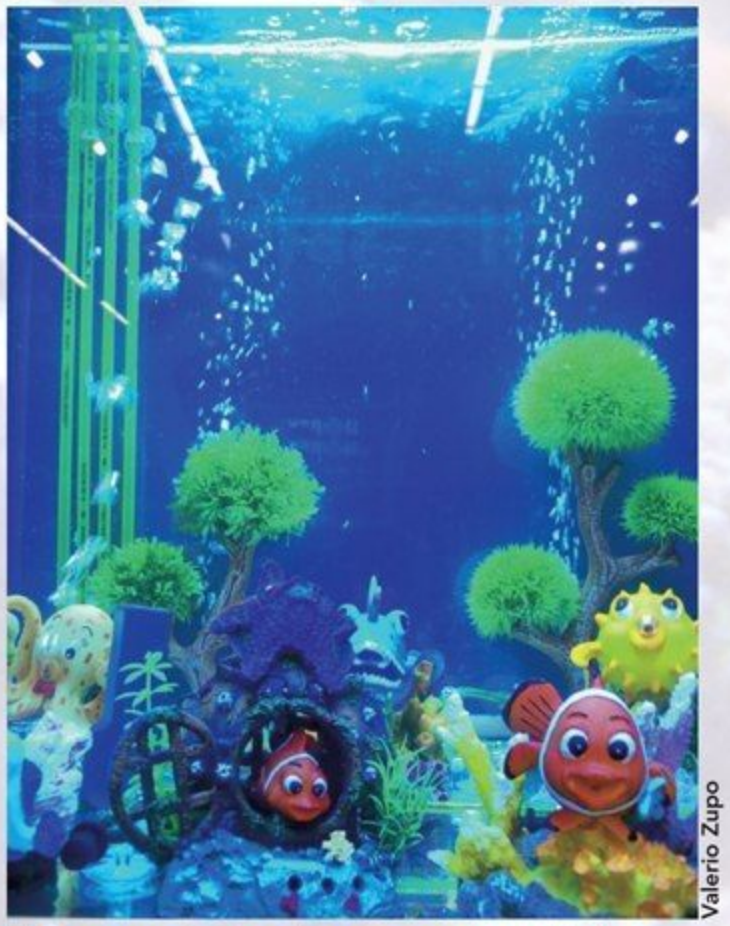
but I believe the value provided is much higher.

Algae Removers

Several products for removing algae were also on display. Some employed round magnets while others incorporated abrasive tissue with blades effective against even the most resistant coralline algae. Others utilized vibration razors to minimize effort and maximize results. Nobody wants to spend too much time on aquarium maintenance, especially cleaning algae!

UV Sterilizers

There have been a number of interesting developments in the field of UV radiation and sterilizers. Besides large ozone sterilizers that could be adapted for use in garden ponds, there were excellent UV lamps. Aside from their generous power, their quartz tube is now totally enclosed in a plastic container, which allows for easier maintenance and operation. This also prevents any danger of water coming into contact with the electric parts. As a result, you can change the UV tube



Valerio Zupo

■ Ornaments for all ages were on display.

while the water is still flowing into your apparatus.

Fish and Inverts

Despite all of this new technology, my main interest remained the same: live organisms. The fair housed an explosion of importers and distributors shipping all over the world, and several of them were looking for new local dealers. The quality of fish, invertebrates, and plants was simply excellent. Several new or rare species were even on display. Young coral breeders exhibited gorgeous specimens, and fish distributors, mainly from oriental lands, were showing interesting, healthy livestock.

In the field of aquatic plants, I was surprised by both the rarity of the species available and the packaging techniques. Plants delivered in nutritional gels contained in small cups seem very promising. These plants retain their full strength right up to when they're planted, and taking them out of the gel is as easy as passing them under a water jet for a few seconds.

With new products and animals at every corner, the latest Interzoo offered plenty to see. The show provided an excellent peek at LED lamps and other efficient, easily manageable electronics; food enhancements; novelty tanks; and even rare species collected or reproduced with respect to their natural environments. Hobbyists expecting the latest and greatest of aquatic goods were certainly satisfied!

Aquarium Success

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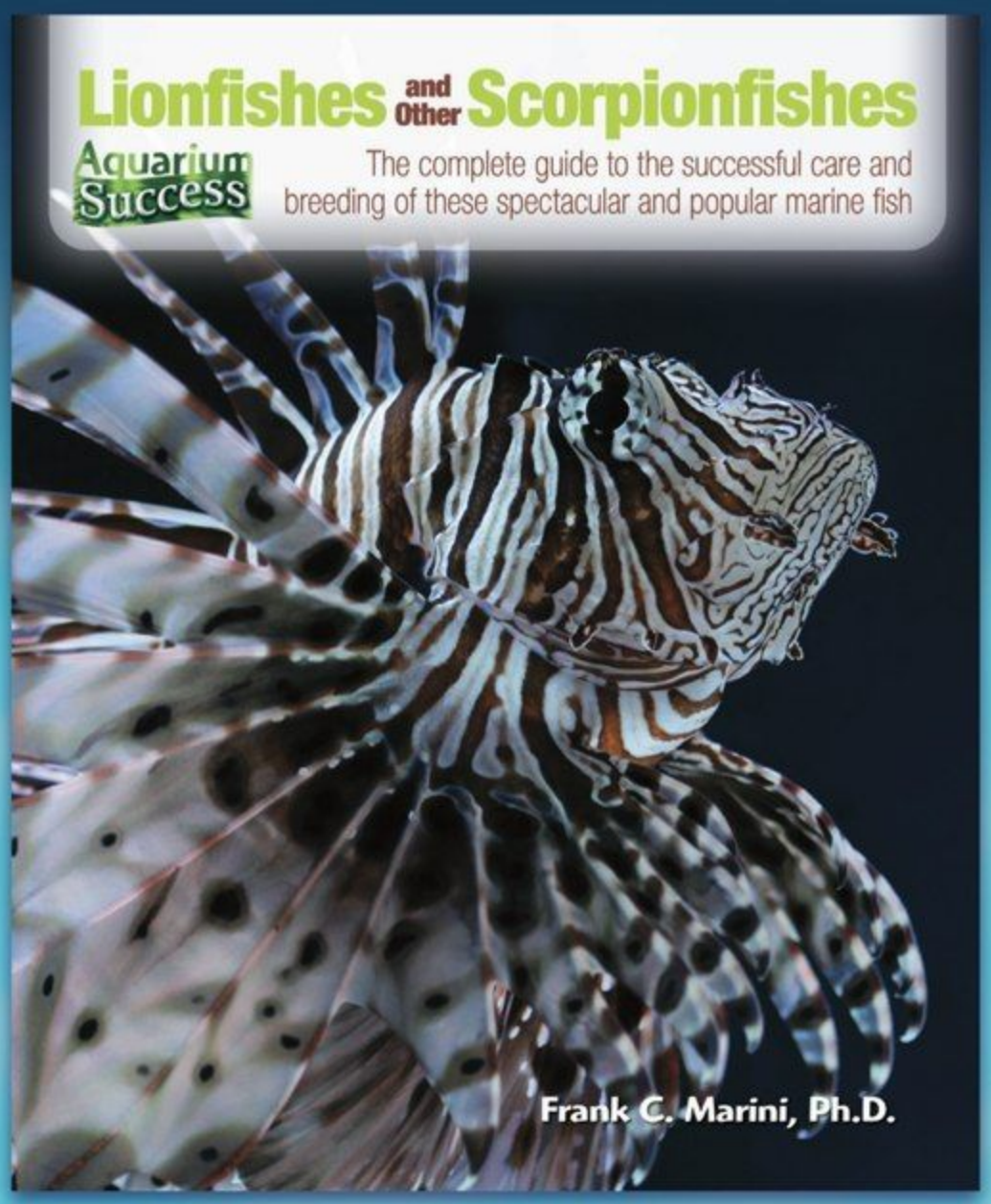

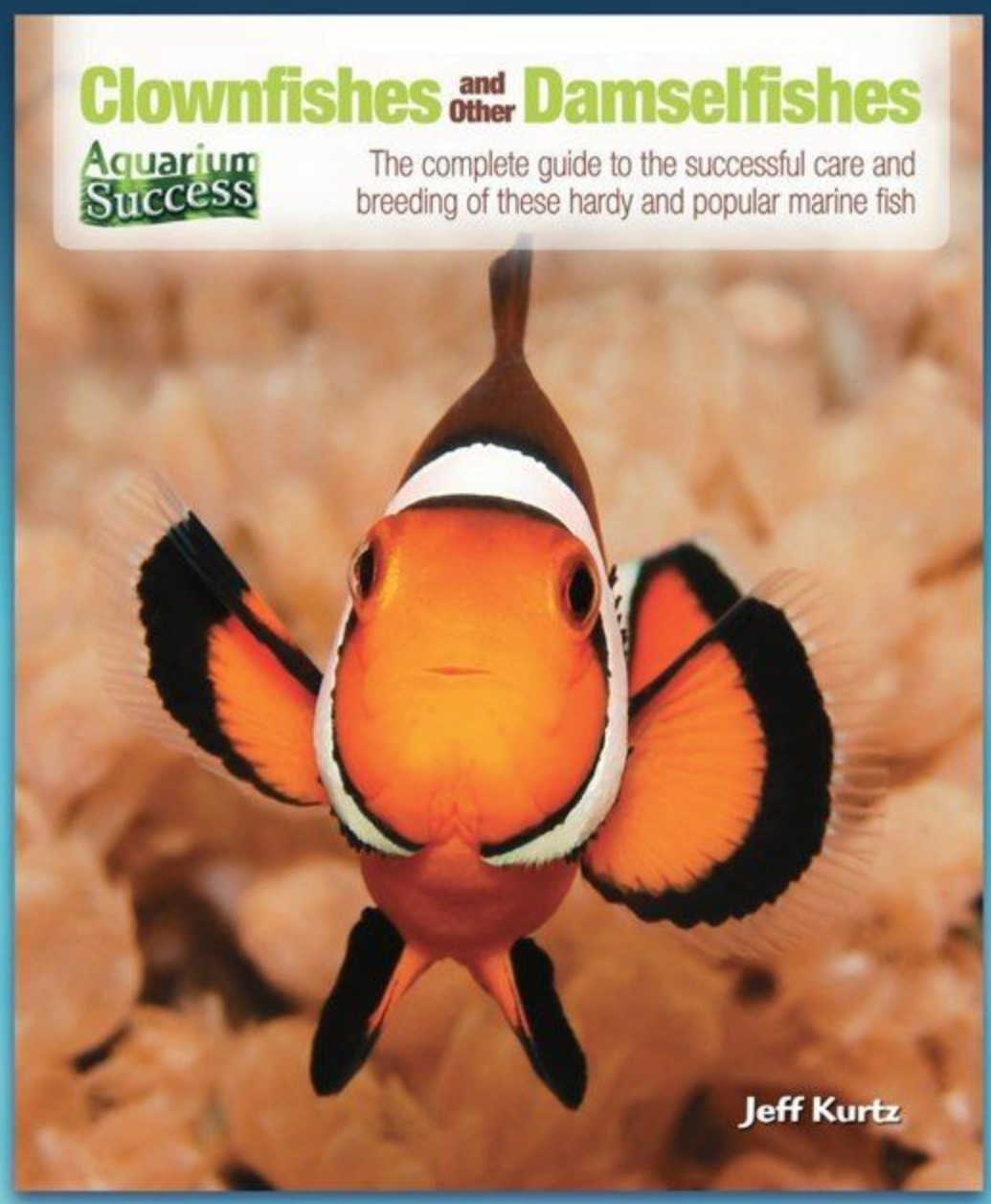

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Each of these books contains expertly written advice on the care and breeding of specific groups of fish. Each one details the proper aquariums, water chemistry, temperature, diet, breeding, and other important topics for keeping these fish. They also contain a guide to available species and discussion of suitable tankmates. These books put the keys to having a successful aquarium right in your hands.

Books available at www.petbookexpress.com and at aquatics and book retailers nationwide.
For additional book info visit us online at www.tfh.com

meeting place

events

September 28–30 • Dallas/Fort Worth, Texas

The Marine Aquarium Conference of North America (MACNA) is the largest and oldest conference focused on the marine aquarium hobbyist. This year's show will take place September 28–30 at the Sheraton Dallas Hotel in Dallas/Fort Worth, Texas. Aquarium enthusiasts and avid reefkeepers will have the opportunity to meet peers and professionals, as well as discover new technologies and purchase cutting-edge equipment. Attendees will also have the opportunity to acquire some of the finest handpicked corals. For more information, visit **www.dfwmacna.com.**

October 14 • Newington, New Hampshire

The New Hampshire Aquarium Society (NHAS) will hold its annual auction on Sunday, October 14 in the Newington Town Hall of Newington, NH. The town hall is located just off Route 16, west of Portsmouth, NH, just off I-95. The doors open at 9:00 a.m. and the auction starts at noon. A wide variety of aquarium species, both fish and plants, along with live foods and hardware will be available. The public is invited to buy and sell. Food will be sold during the auction. For more information, visit **www.nhaquariumsociety.com.**

clubs

REGIONAL

American Cichlid Association

Come join in the largest and most distinguished national organization of the cichlid hobby! Your membership in the American Cichlid Association (ACA) entitles you to six issues per year of our highly acclaimed Buntbarsche Bulletin and access to our online Trading Post, and each July the ACA hosts a fabulous convention not to be missed! Your membership in the ACA will offer so much more, such as participation in the Paul V. Loiselle Conservation Fund, cichlid research through the Guy D. Jordan Endowment Fund, hands-on cichlid conservation through ACA C.A.R.E.S., a speaker program, a Club Liaison Program, special awards, and an up-to-date, informative ACA website at **www.cichlid.org**

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. Loiselle 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. Calavar 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.cbsbettas.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**

LAFishFanatics

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. **www.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 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.rmcichlid.org**

CONNECTICUT

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**

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.spacecoastreefclub.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**

HAWAI'I

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 centralillinoistac 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. Dorner 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

Meetings 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.brooklynaquariumsociety.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.raleighaquariumsociety.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.clevelandaquariumsociety.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 and 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 the 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.**

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 Maclure 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. Contract erik.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://madisonaquatichobby.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**

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 Aquariophiles de Quebec
Meets 7:30 p.m. on the second Monday of every month at 2125 Louis-Jolliet, 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**

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 AquaticHobbyist 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.indianaquariumhobbyist.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
Please visit website for meeting times and other information. **http://www.gas-online.org**

MEXICO

Comunidad Acuariofila Regiomontana
An association dedicated to the study, conservation, and propagation of all fishes, plants, and other aquatic life. Located in Monterrey, Nuevo León, Mexico. Annual membership is $15. Meets every second Saturday of each month at 3:00 p.m. Mail us at info@carac.com.mx for additional information or visit **www.carac.com.mx**

PUERTO RICO

Aquarists Metro East of Puerto Rico
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

Charles Clapsaddle

ALA 2012 Convention

The American Livebearer Association's (ALA) 2012 Convention was hosted by the Gold Coast Aquarium Society of South Florida in Fort Lauderdale, Florida, April 26–29. The convention featured a collecting trip, visits to an aquatic plant nursery and tropical fish farms, six speakers on various fish-related topics, a workshop on artificial insemination, vendor displays, a judged fish show, an awards banquet, and an auction. The local sponsoring club, headed by show chairman Ron Davis, did an excellent job. I know how hard it is to coordinate a function like this; I was the ALA 2008 Convention chair. It is a lot of work.


Ron Davis

The Sunday auction was packed with hobbyists looking to bring home all sorts of fish, plants, and equipment.

Due to work restrictions (fish hatchery work is never done), I managed to miss the collecting trips and the visits to the aquatic plant nursery and fish farms, but I did get to attend most of the speakers' presentations. There were talks on raising show-quality fish, interspecific hybrids, water quality, fish diseases, goodeids, and collecting fish. I especially enjoyed Dr. Roy Levine's excellent talk on swordtail and platy hybrids. He also conducted an artificial insemination workshop, which I missed since it was sold out.

Judging from the number of species and fish collected, the field collecting trip was a success with many local mollies ending up going home with happy hobbyists. I was given a nice pair of *Poecilia latipinna*, a sail-fin molly, to add to my growing collection of ecotypes of this species. While some nice mollies were collected, many other fish, including sunfish and killifish, were captured. In addition to fish, the collectors saw wildlife including alligators and water snakes.

The fish show attracted a wide range of entries, including wild species and domestic livebearers. There were some spectacular fish, and I didn't envy the judges having to choose winners from among so many nice specimens.

As is tradition, the ALA board of directors granted a scholarship to a young researcher conducting experiments concerning livebearer fishes. This year's award and scholarship was given to Courtney N. Passow of Oklahoma State University for her project, "Effects of Food Availability on the Metabolic Rates of Different *Poecilia mexicana* Ecotypes." According to my sources, the voting was very close and any of the nine entrants would have deserved the award and grant. Additionally, the ALA board of directors approved grants for the University of Morelia and the University of Guadalajara for the maintenance of an ecologically critical spring in Mexico.


Ron Davis

The author (top) mingles with like-minded fishkeepers during the convention's barbecue.


Ron Davis

This Montezuma swordtail (*Xiphophorus montezumae*) placed first in the wild sword category of the fish show.

ALA conventions always end with lively Sunday auctions. This year's auction featured thousands of fish (mainly livebearers, but also some interesting cichlids), plants, and equipment. Unfortunately for me, but fortunately for my bank account, I was unable to stay past the first hour of bidding, which probably lasted for another eight to ten hours. Even leaving early, I went home with eight species of livebearers to add to my growing collection.

Next year's ALA Convention 2013 will be in Grand Rapids, Michigan. The local club sponsoring the convention will be Grand Valley Aquarium Club. I'll see you there!

classifieds

AQUATIC PLANTS

BUSINESS OPPORTUNITIES

FISH

FORUMS

LIVESTOCK & EQUIPMENT

Product Spotlight

Liquid Additives

ADA's Green Brighty series is made with desalinated deep seawater containing rich minerals extracted from natural resources that cannot be produced artificially. The product lineup consists of three varieties (STEP 1, STEP 2, STEP 3), which represent ADA's original nutrient supply method developed from their experience and idea of supplying adequate nutrients for each stage of the aquarium. For growing aquatic plants, it is effective to supply potassium by Brighty K and trace elements by Green Brighty series, and the positive effects have been proven in many beautiful Nature Aquarium layouts (deep seawater is not contained in Brighty K). For more details, please visit our website www.adana.co.jp/en/ and Aqua Journal Digital at www.aquajournal-digital.net.

Nitrifying Bacteria

FritzZyme introduces TurboStart 700 and 900 for cycling aquariums, allowing for safe, immediate addition of livestock. TurboStart may be added to new tanks or established systems any time the biofilter needs fortification: after water changes, aggressive cleaning, adding new livestock, medicating, or changing filter media. FritzZyme TurboStart 700 contains live freshwater-specific species of nitrifying bacteria, and FritzZyme TurboStart 900 contains live saltwater-specific species of nitrifying bacteria. TurboStart is shipped overnight on ice to local dealers to ensure that the freshest viable product is made available to the hobbyist. For more information, visit www.fritzzyme.com

Marine Supplements

Hagen introduces its Fluval Sea Marine Supplements line, consisting of seven formulas made with fine, ultra-pure ingredients that contain the necessary trace elements regularly depleted in marine aquariums, often by the large varieties of corals housed within the habitat that can consume specific compounds faster than others. Because a marine aquarium is a closed environment, these elements are not endlessly replaced as they are in the ocean. Fluval Sea helps replenish them and ensures that the water in marine aquariums is as close to the natural ocean as possible, which in turn helps to keep the fish and corals healthy. Rated for high purity, Fluval Sea Marine Supplements include three ions, trace elements, strontium, iodine, magnesium, calcium, and alkalinity. All Fluval Sea Marine Supplements are free of gluconates, nitrates and phosphates, and are available in three sizes. For more information, visit www.hagen.com.

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...

60 years of *TFH*

We can't believe it—we're turning 60! For the past 60 years, *TFH* has been *the* source for the best fishkeeping information including care advice, new species announcements, new techniques, and much, much more. Check out the September 2012 issue to see a few milestones of where we've been, and great articles about where we're going!

60th Anniversary

Stefan von Ameln/Shutterstock

bicolor angels

A gorgeous species that is somewhat difficult to keep, the bicolor angel (*Centropyge bicolor*) is a favorite of marine aquarists. It is an intelligent, playful reef species with very strict requirements that must be met for it to thrive. One expert reefkeeper figured out these needs and provides guidelines on everything from choosing a healthy specimen to providing the right foods.

building a fishroom

Have you been bitten by the hobby bug and now have more tanks than you know what to do with? Do you only have one tank now but want more—if only you had the space? Then a fishroom might be the option you've been looking for. One hobbyist built his own fishroom and offers his tips and tricks to make an easy, efficient place that you can dedicate to your favorite aquatic animals.

Ted Judy

Read About All This and Much, Much More in the September 2012 Issue of *TFH*!

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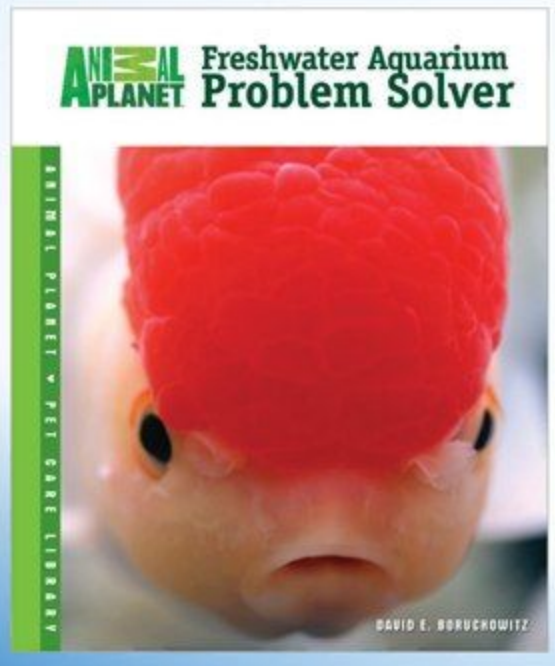

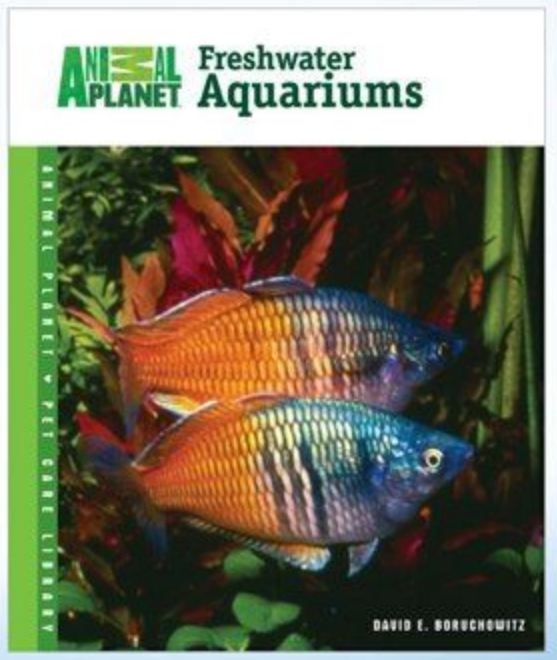

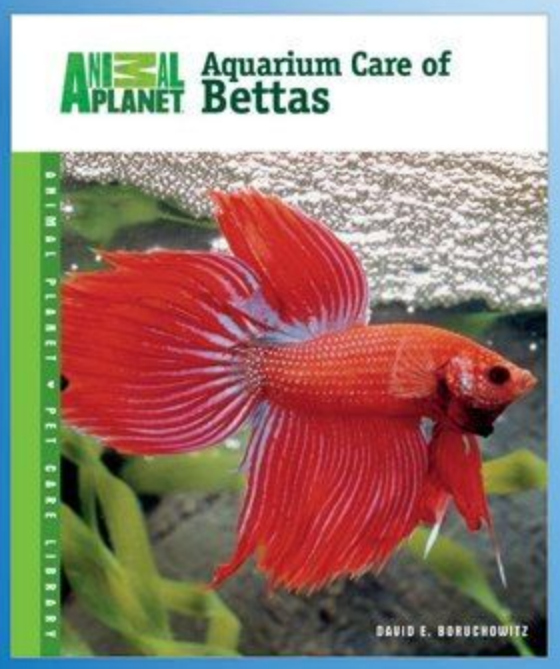

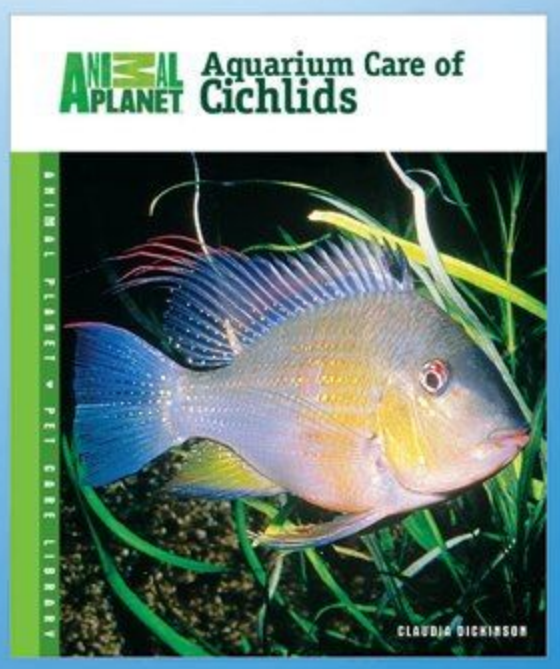

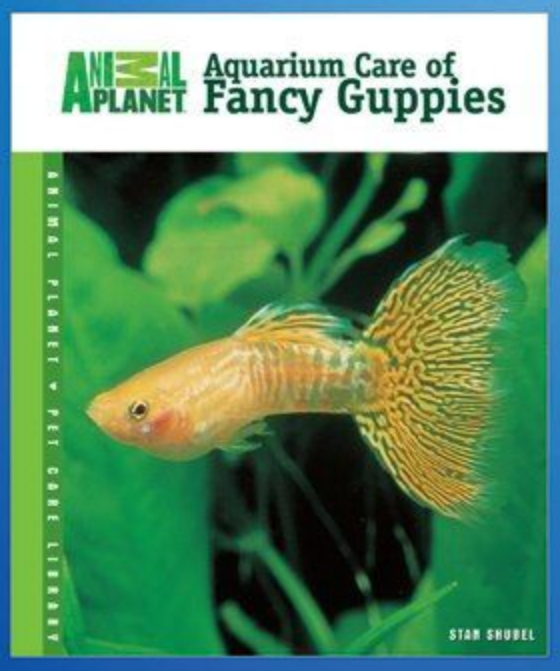

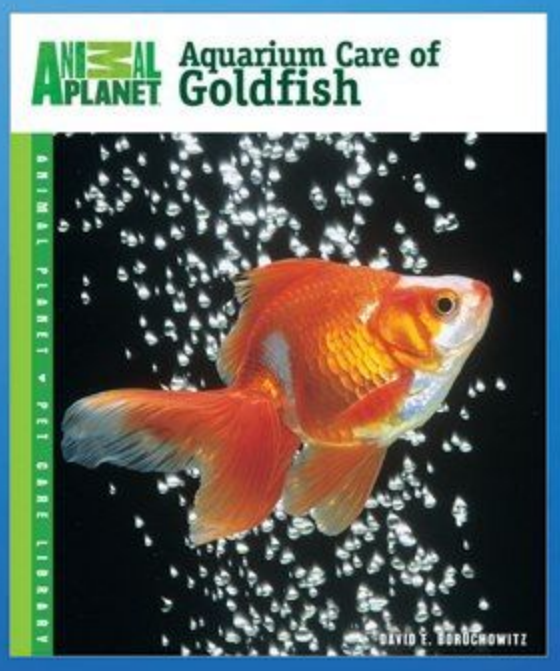

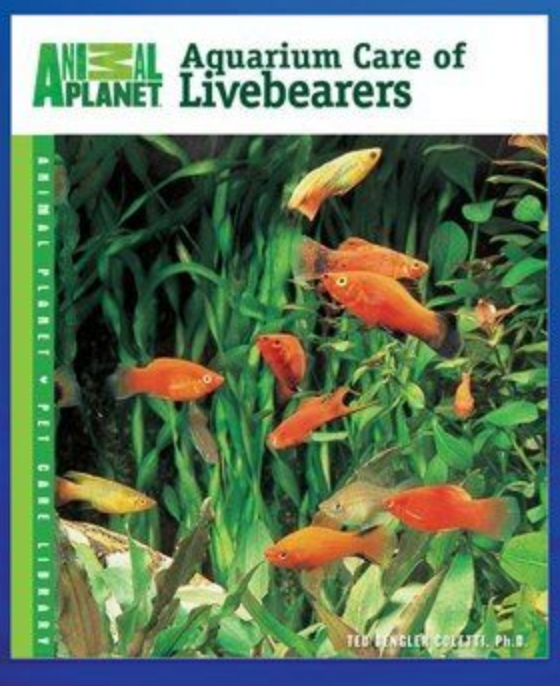

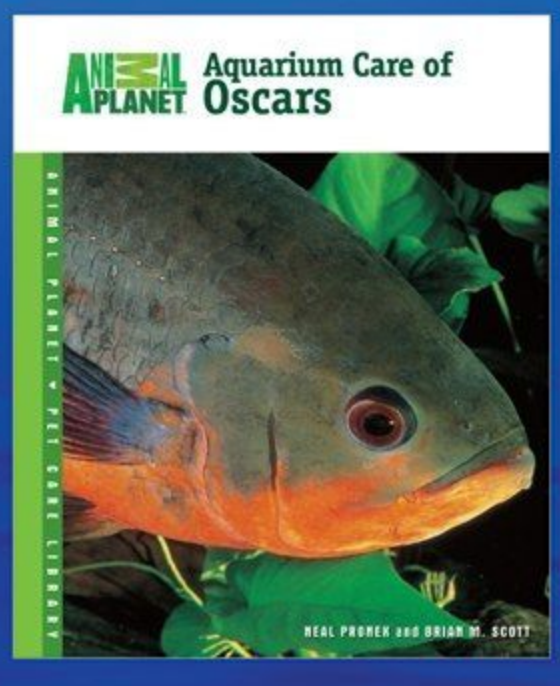

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PARTING SHOT

Photo: Lea Lee

saber squirrelfish

Sargocentron spiniferum

Diver and underwater photographer Lea Lee (www.lealee.ch) captured this colorful scene of peering squirrelfish at the Felidhoo Atoll's Golden Wall dive site. Located in the Maldives, this area is famous for its large population of red and yellow soft corals.

Lea remembers a very strong current that encouraged the soft corals around her to open up. She eventually spotted this group of hiding squirrelfish and fought the waters, getting close enough with her fisheye lens for a good shot. To prevent the fish from getting scared and swimming out of view, Lea turned upside down (head down and legs upward) and approached them slowly from behind the coral to avoid being seen. Despite all the forces working against her, she managed to capture a heartfelt scene.

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