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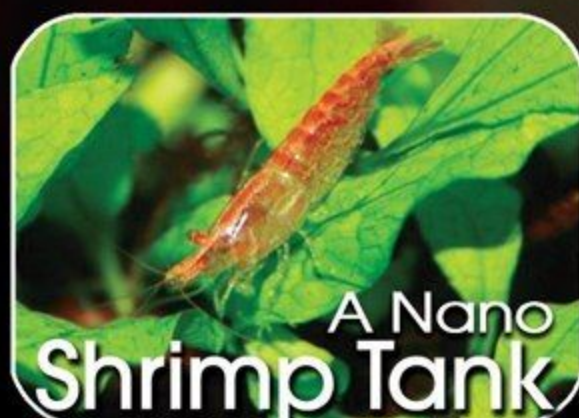
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The red lionfish is recognizable by almost anyone, marine hobbyist or not, but dwarf lions are not nearly as eminent. Dwarf lionfish have all the grace and beauty of their larger cousins, but their smaller size makes them easier to keep in a reasonably sized home aquarium, and their smaller mouths allow them to be paired with a greater variety of tankmates. The species on our cover, the zebra turkeyfish (*Dendrochirus zebra*), is the most commonly seen dwarf lion and is sure to delight anyone who keeps it (p. 86).

Photograph by Sergey Skleznev/Shutterstock

Our cover photo is available for your wallpaper and/or screensaver in the downloads section of [tfhmagazine.com](http://tfhmagazine.com).

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### TFH Magazine

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1-888-859-9034

### T.F.H. Publications, Inc.

president /chief executive officer: Glen S. Axelrod

executive vice president: Mark E. Johnson

vice president, creative direction: Nancy S. Rivadeneira

publisher: Christopher T. Reggio

*Tropical Fish Hobbyist*® (ISSN 0041-3259) is published monthly for \$28.00 per year by T.F.H. Publications, Inc., 1 TFH Plaza, Neptune City, New Jersey 07753. Periodicals postage paid at Neptune, New Jersey, and additional mailing offices. POSTMASTER: Send address changes to: Tropical Fish Hobbyist, One TFH Plaza, Neptune City, New Jersey 07753; Phone: (800) 631-2188; <http://www.tfhmagazine.com>; e-mail: [editor@tfh.com](mailto:editor@tfh.com). Copyright ©2011 by T.F.H. Publications, Inc. Rates: \$4.95 per copy in the U.S.; \$6.95 per copy in Canada; £3.50 per copy in the UK; \$28.00 for 12-issue subscription; \$49.00 for 24-issue subscription. U.S. residents add \$3.95 (waived if ordered online) for postage per year; Canadian orders add \$20 for postage per year; Foreign orders add \$25 for postage per year. U.S. funds only. Index available in every 12th issue. In England and the western Sterling area *Tropical Fish Hobbyist*® Magazine and T.F.H. books distributed exclusively through T.F.H. Publications (Great Britain) Ltd., P.O. Box 74, Havant PO9 5TT; in Australia and the South Pacific by T.F.H. Australia, Box 149, Brookvale 2100 N.S.W., Australia; in New Zealand by Brooklands Aquarium Ltd., 5 McGiven Drive, New Plymouth, RD1 New Zealand; in South Africa by Rolf C. Hagen S.A. (PTY.) Ltd., P.O. Box 201199, Durban North 4016, South Africa. Advertisements submitted to *Tropical Fish Hobbyist* for the sale of products, equipment, services, and live animals are accepted in good faith. T.F.H. Publications, Inc. cannot be responsible for advertisers' distribution, claims, slogans, website content, or products. Readers are advised to do any necessary research and preparation before purchasing items. T.F.H. Publications, Inc. One TFH Plaza, Third and Union Aves., Neptune City, NJ 07753; email [info@tfh.com](mailto:info@tfh.com). For Advertising Sales, call (732) 897-6827. Stores: call (732) 897-6824 to carry *Tropical Fish Hobbyist*. *Tropical Fish Hobbyist*® is a registered trademark of T.F.H. Publications, Inc. All articles and photographs are completely covered by T.F.H. Publications copyright. No reproduction in any medium (including electronic) is allowed without express written permission of the publisher. [www.tfhmagazine.com](http://www.tfhmagazine.com)

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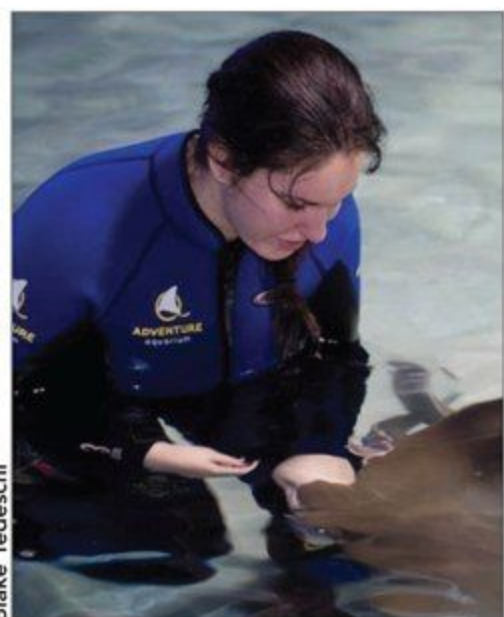
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## editor's note



Blake Tedeschi

**D**isease is a reality of life. When you're human, it's easy to recognize the symptoms of being sick (fever, sneezing, coughing, etc.) and the causes (fluctuating temperatures, sick coworkers, and so on). Recognizing the symptoms of a sick fish and identifying the causes is not always so simple, however.

Of course, the first step to figuring out how your fish are doing is to observe them. "Cichlid World" columnist Eric Hanneman learned this lesson the hard way. He called me up recently and told me a sadly familiar story: He acquired new cichlids from a fellow hobbyist and, thinking they were clean, didn't quarantine them. Then he got busy and was unable to check up on them for a week. When he finally had the opportunity to have a good look at his new fish, he saw the telltale signs of the dreaded ich! As a longtime hobbyist, Eric was able to quickly administer a treatment for his ailing fish and help them get better in short order. However, he was shocked when the stubborn parasites reappeared in his tanks months later. In this month's column, Eric explains how he finally eradicated this terrible pest from his entire system (p. 28).

But even when you follow the rules, quarantining new fish and observing them regularly, they can still get sick. Accomplished

veterinarian David Watson was taken by surprise when his friend's freshwater community tank was overrun by mycobacteriosis, even though his friend hadn't added any new fish and it had been running just fine for years. Thanks to David's quick thinking and pertinent advice, his friend was able to save at least some of his fish from the clutches of this devastating bacteria (p. 70).

Fish, not unlike humans, are most susceptible to disease when stressed. As Jay Hemdal explains, one source of stress for fish is acclimation, but there are techniques that can greatly minimize the stress they experience when being added to a new system (p. 74). Another source of stress for fish is being kept in incorrect environments. Whether you decide to recreate the biotope a fish comes from (p. 60) or provide the very specific environmental needs of the animal you're caring for (p. 92), creating an appropriate habitat goes a long way toward maintaining healthy animals.

On a different note, we are proud to again be sponsoring the Marine Aquarium Expo (MAX) in Costa Mesa, California from March 31 to April 1, 2012. Be sure to check out the rest of this month's issue for timely and informative coverage of the marine hobby, including helpful articles on keeping semicircle angelfish (p. 48), dwarf lionfish (p. 86), and brain corals (p. 78).

Here's to a healthy month for you and your aquatic pets!

Shari Horowitz  
Managing Editor  
*Tropical Fish Hobbyist*

## readers' forum

### Responses to Electric Blue Rams (TFH March '12)

I kept and bred [electric blue rams] for years. They are very picky on water conditions! I started with wild breds, and as the generations came down, the tank breds were a little more tolerate of water temps. The hard part for people new to them is that they require a much higher heat in the tank, and that makes matching tankmates a little bit harder. If that is the case, I always tell them to fall back on the Bolivian ram—not as colorful as the blues, but they can be gorgeous if well kept!

Alnee Baldwin Bailey

These are cool! I have been thinking of adding these to my discus tank. The higher temp requirements, along with softer and cleaner water requirements, seem to make them a good choice. Has anybody kept rams with discus with any success?

Darrell Dalton

I am setting up a 125-gallon tank just for discus and rams. I like the rams more than discus, but they work so well together.

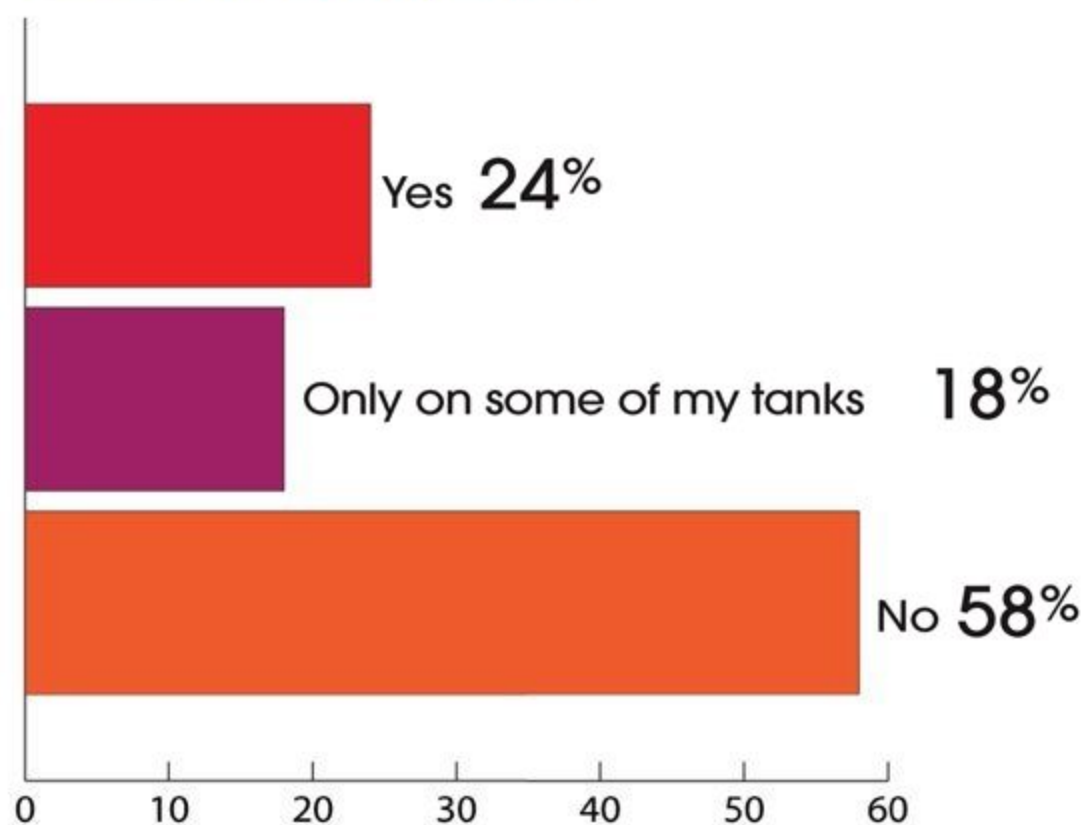
Brad Voshell

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**In This Issue:** Tetras are some of the most common fish in the hobby, but they are not bred nearly as often as, say, livebearers. As a master fish breeder explains, "I always get a lot of questions about breeding tetras, so when I started having success with this beautiful new species, I thought it would be good to share my experiences with them."

**Other Works:** *Culturing Live Foods* and *Complete Herp Care: Raising Live Foods*

**Why Breed Fish?** "I've been interested in breeding fish since I watched a green swordtail give birth when I was in grade school."

**Most Difficult Fish to Breed:** "The most challenging species so far has to be *Syngnathus scovelli*, the Gulf pipefish. That took me several tries before I was successful at raising fry to adulthood. The one that I've been working on the longest (since before the *TFH* Breeder's Challenge, January 2010 started) that still is giving me trouble is the banjo catfish—whichever two species that I have. I've had eggs twice from one species, but no luck getting them to hatch yet."



mike  
hellweg



philip  
hunt



**In This Issue:** Brain corals are some of the most commonly found and recognizable corals. As this expert reefkeeper explains, "I've always been fascinated by brain corals and have kept them ever since starting my first reef tank. I love the weird forms, often coupled with superb colors, and I don't think they get enough attention in the aquarium media."

**Other Works:** *The Marine Reef Aquarium*, *What Fish? A Buyer's Guide to Reef Fish*

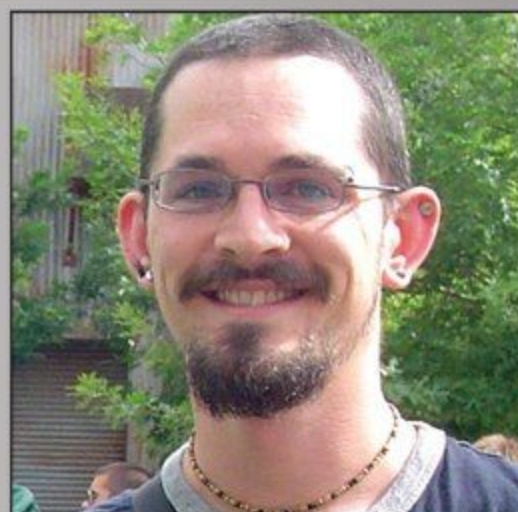
**Craziest Fishkeeping Story:** "Probably getting splattered with bioluminescent slime while extracting a predatory worm from live rock."

**Best Advice for Starting in Saltwater:** "I have two pieces: Do your research before you buy fishes or inverts, and never stint on tank maintenance."

**In This Issue:** Sea pens are relatively uncommon in the aquarium trade and are the subject of many myths regarding their care. As this aquarium industry professional explains, "After working with and selling this species, I learned two things. First, while detailed care for sea pens does exist, it is not common in many books sold by retailers compared to the number of retailers that sell *Tropical Fish Hobbyist*. Second, based on my ability to keep them alive and my capability to explain to customers how to keep them long term paired with the positive results the customer had following that advice, I felt that I had a lot of good information to share with *TFH* readers about this unique species."

**Founder of:** Reptaquatics.com

**How Did You Go Pro?** "I don't really know to be honest. I've always had an interest in aquatic life and knew from a very young age that I wanted to spend my life working in the aquarium field. I set a goal and I continue to follow through with it."



bill  
rosser



dave  
watson



**In This Issue:** Mycobacteriosis is a very common aquarium disease that is rarely diagnosed properly. It is extremely virulent and can easily wipe out an entire tank. According to this veterinarian, "Given the fact mycobacteriosis is transmissible to fishkeepers, I think all aquarists should have a basic understanding of this disease."

**Other Works:** "The Classroom Aquarium" and "Breeding the Pajama Cardinalfish" (*TFH* May 2010)

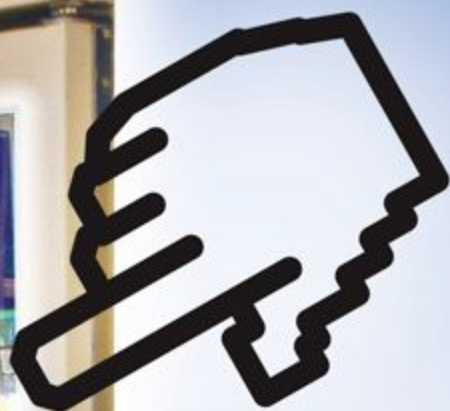
**Why Be a Vet:** "I enjoy helping people care for the well being of their animals, from the tiniest pet fish to the 1,900-pound dairy cows I see every day."

**Challenges Treating Fish:** "The most difficult part of my job is that my patients can't tell me what hurts or how they are feeling. Whether I'm treating a cow or a fish, being a careful observer is key to making a diagnosis. Although performing a physical on a cow is much easier than on a fish, when working with fish, I don't have to worry about getting kicked."

also in this issue: Takashi Amano, Mark Denaro, Jay Hemdal, Bob Fenner, James Fatherree, Jack Wattle, Eric Hanneman, Ben Johnson, and Charles Clapsaddle



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Enjoyed the two-part article by Jay Hemdal on acclimating fish and other animals to aquariums, but still looking for even more advice? Well, look no further than the *TFH* Extras blog! A major debate among aquarists is whether or not shipping water should go into an aquarium when transferring a fish. Some say the water contains parasites and toxins that should be avoided no matter what, while others say it doesn't really have an impact. Find out Jay's take on this heated debate.

If you're a dedicated reefer who already has brain corals or wishes to add one after reading Philip Hunt's article this month, one thing you'll certainly want to know is how to propagate them. Propagation leads to lessened collecting pressures on wild colonies and can even get you money or credit at your local fish store. The challenge is that there are so many ways to frag different types of corals. Philip offers his tried-and-true methods for propagating brain corals on the *TFH* Extras blog.

A different type of challenge for fishkeepers happens before any plants, animals, or even water is added to the aquarium—where do you put your tank? Aquariums can be extremely heavy, and putting them in the wrong spot can damage your home or make it difficult to view your setup. One author reviews the many factors that should be taken into consideration so such mistakes can be avoided.



Bob Goemans

Learn how to propagate brain corals by reading Philip Hunt's blog entry.

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## *Cyprichromis microlepidotus*

The Cyprichromini tribe of cichlids from Lake Tanganyika is different from the majority of Rift Lake cichlids seen in the hobby. Being that they are more peaceful than most of their brethren, live in open water, and spawn in the middle of the water column, they have different requirements in the aquarium than many of their counterparts.

*Cyprichromis microlepidotus* is a particularly striking member of the Cyprichromini tribe, with its bold yellow and purple coloration. When kept in large groups of at least eight or so fish, with at least two females for every male, they will exhibit their best colors. *C. microlepidotus* will occupy open water areas and require stacked rock formations with caves and overhangs to hide in and among. They can be kept with peaceful bottom-dwelling cichlids, but any aggressive species that will outcompete them at mealtime should be left out of their aquarium. Make sure to feed small foods multiple times daily, as these grazers nibble on zooplankton throughout the day in their natural habitat.





# Q&A freshwater

## Q Cockatoo Cichlid Questions

Last week, I purchased a male/female pair of triple red cockatoo cichlids and put them in a fully cycled 25-gallon tank. For the most part, they seem to be doing okay, but I've noticed a few troubling things. One is that the male harasses the female constantly so she stays in her flowerpot cave all the time. She'll show herself briefly when food is in the water, but then she goes right back into hiding. Is there anything I can do to help them make peace? Also, I've noticed that the male's color has faded since I got him. Would you suggest feeding color-enhancing foods? I don't think water quality is an issue. I keep the water temperature at 78°F. The pH is 6.8, and the hardness is 10 dH. Ammonia and nitrite are 0, and nitrate is 5 ppm.

Frank Ulrich  
Colorado Springs, Colorado

**A** Cockatoo cichlids (*Apistogramma cacatuoides*) are best kept harem style—one male to at least three or four females—so introducing a few more females to the tank should help minimize the harassment you're seeing now. With several females on the scene, the male's attention will be divided among them so no individual will be constantly tormented.

With respect to the male's faded coloration, I agree that water quality probably isn't the issue based on the values you've provided. Feeding color-enhancing foods certainly won't hurt, but since the fading occurred within a week of purchasing the cockatoos, it seems unlikely that nutrition is to blame. Fish will often exhibit faded coloration when kept over light-colored substrates or when

lighting is overly intense for the species. I've also observed that fish will sometimes fade in color when kept in a tank that lacks some type of background or when sufficient cover is lacking. Then again, it may simply be that the male isn't exhibiting his best coloration because he's still a bit stressed from being transferred. So, you might want to explore those different possibilities to see if one of them makes sense in your situation.

## Q UV Sterilizer and Ich

My fancy guppies are currently experiencing a major ich outbreak. It's totally my fault because I recently added a new male to the tank without quarantining it first. Lesson learned! Now that I've got this problem, I'm trying to figure out the best way to solve it. If possible, I'd prefer not to medicate the tank. Do you think an ultraviolet sterilizer will kill all the parasites?

Brenda Donaldson  
Ontario, California

**A** While an ultraviolet (UV) sterilizer can be helpful in controlling *Ichthyophthirius multifiliis*, it can't rid an aquarium of this aggravating parasite all by itself. Remember, ich has a multistage life cycle. During one stage, the parasite is attached to and feeding on a fish host. Next, it detaches from the fish, drops to the substrate, and forms a cyst. Inside the cyst, the parasite begins to reproduce to form hundreds of infective parasites. Eventually, the cyst bursts and the now free-swimming parasites are released into the water column to seek out another fish host, which they must find within a few days or they will die.

## 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](mailto: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](http://forums.tfhmagazine.com).

A UV sterilizer can kill only those microorganisms that are pumped through the unit and exposed to the UV bulb. That means only the free-swimming stage of the ich parasite is vulnerable and only those free swimmers that pass through the UV sterilizer will be killed. The simple fact is that many of the free swimmers will not be drawn into the sterilizer and can, therefore, go on to infect your fish and continue the life cycle. So again, while a UV sterilizer certainly can aid in managing ich, along with various other parasites and pathogens, it shouldn't be viewed as a silver bullet against parasites.

## Q Non-Aquatic Aquarium Plants

I'm a longtime houseplant enthusiast, but I've only recently taken the plunge into planted aquarium keeping. I've been very surprised to see many of the houseplants I'm familiar with being sold for aquarium use. For example, a pet store near my home was recently selling *Dracaena*, *Dieffenbachia*, and *Caladium* in their aquarium department. Are these plants actually able to survive under water? If not, why on earth are they being sold as aquarium plants?

Elizabeth Cook  
via email

Unfortunately, the plants you listed will not survive for more than a few weeks to months (if you're very lucky) under water—and they're just a sampling of the terrestrial houseplants that are occasionally sold as aquarium plants. They continue to be sold as such for the simple reason that people continue to buy them as such. No doubt, many people who purchase them are completely unaware that they're getting a terrestrial plant that is doomed to die under water. Others might be aware of what they're getting but buy them anyway with the intention of enjoying them for a while and then replacing them when they inevitably die. The former situation is particularly shameful because it sets up unwitting hobbyists for certain failure and could discourage them from trying aquarium plants again when they might have enjoyed rewarding success with truly aquatic plants. I guess it's just one more good reason to do your homework before buying any plant or animal and introducing it to your aquarium.

## Q Barbados Cory?

My local fish store has a catfish for sale with really neat patterning labeled as the



S-ts/Shutterstock

■ To keep the peace in cockatoo cichlid (*Apistogramma cacatuoides*) groups, ensure that there are three to four females for every male.



Andrzej Zabawski

■ Banded cory (*Scleromystax barbatus*).

Barbados cory. Have you ever heard of a cory catfish from Barbados?

Joseph Kruse  
via email

I have a feeling someone at your local fish store goofed on spelling when making this fish's ID label. There are no Corydoras catfishes on Barbados, but there is a cory, commonly known as the banded cory, with the species name *barbatus*—*Scleromystax barbatus* (formerly *Corydoras barbatus*). My guess is that's the fish you saw for sale. *S. barbatus* is a subtropical South American species, which, according to FishBase.org, is found in coastal drainages from Rio de Janeiro to Santa Catarina, Brazil. As cory cats go, *S. barbatus* is quite large, reaching about 4

inches in standard length (a measurement that does not include the caudal fin).

## Q Shy Zebra Pleco

Dear TFH, I love your magazine! I have learned and continue to learn so much from this publication. I wait eagerly every month for its arrival and read it cover to cover many times over.

Three weeks ago, I purchased a young zebra pleco from the aquarium store that I always shop at. They had five tank-bred fish that had been in the store for a week and a half and were eating and all doing well. The zebra pleco is a fish that I've always wanted, so I just could not say no.

I have the pleco in a planted 30-gallon tank with diamond tetras, cherry barbs,



Ingo Seidel

■ Strategically placed caves and flowerpots will allow zebra plecos (*Hypancistrus zebra*) to remain visible even when they're hiding.

japonica shrimp, oto cats, and one Siamese algae eater. The tank is a low-light setup with driftwood caves, Java moss, different species of *Anubias*, and Java fern.

I saw the pleco for the first time on the third day because it hid where I could see it. On the fourth day, I saw the pleco swim behind and under some driftwood. But since then, I have not seen this fish. I do

know that the zebra pleco is nocturnal (at least that is what I was told). I am feeding the pleco after turning the lights off for the night (I do have a moon light); otherwise, the diamond tetras would steal all the food. I have been offering the pleco many different types of bottom-feeder pellets, but I am not even sure it is getting any. I know the pleco is okay because I have not

had any dead fish and my tank has a full cover. I look in this tank every day.

I use a large canister filter so my water parameters are excellent: pH 7.2, ammonia 0, nitrite 0, nitrate 5 ppm, and temperature 78°F. I do weekly 35 percent water changes, and I never miss. Am I caring for the zebra pleco correctly? Will I ever see it, or does it just need a long time to adjust to the tank before it feels safe and secure? I hope you can give me some information on this very beautiful fish. I hope to have this pleco for many, many years, and I want to take the very best care of it. Thank you for all your help!

Janet Wimbert

Bardonia, New York

**A** Thank you so much for your kind remarks about TFH Magazine! It's great to hear that you continue to find helpful information in each issue. Your zebra pleco (likely *Hypancistrus zebra*) is just doing what comes naturally. As you mention, *H. zebra* is nocturnal, and this shy, reclusive behavior is typical of the species. In time, your specimen may begin to exhibit more boldness and reveal itself more often, but I wouldn't expect it to spend a great deal of time out in the open.

A good way to get around this species' natural coyness is to provide lots of caves with their openings facing the front of the aquarium. For example, in addition to rock caves, strategically placed (so that you can view inside them) sections of PVC pipe and small terracotta flowerpots turned over on their sides can be used to encourage *H. zebra* to "hide in plain sight."

One factor that might be working against you in this regard is the presence of faster-moving fishes in the aquarium. Depending on how many diamond tetras (*Moenkhausia pittieri*) and cherry barbs (*Puntius titteya*) you have in the system, all that activity could intimidate your *H. zebra* into remaining hidden. But without knowing the relative stocking levels of these species, this is purely speculation.

The care and conditions you're providing are appropriate for *H. zebra*. Feeding after lights out was a good idea for this nocturnal species—though it may eventually learn to snatch foods during the day when the rest of the fish are fed. Do be aware that *H. zebra* has more carnivorous tendencies than we usually associate with plecos. Be sure to provide a variety of small meaty foods in addition to some vegetable matter.

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Andy Foden

■ The sparkling gourami (*Trichopsis pumila*) is an excellent species for smaller tanks.

## Q Sparkling Gourami for Nano Tank

I'm looking for a good fish to keep in a 5-gallon aquarium. What is your opinion on the sparkling gourami for a tank this size?

Sudhir Rehman  
via email

Assuming that the sparkling gourami in question is *Trichopsis pumila* (sparkling gourami is just one appellation given to this species in addition to pygmy gourami, dwarf croaking gourami, and many other common names), I'd say this species would be an excellent choice for your 5-gallon tank, and you can safely keep a small group of them. In fact, one could argue that *T. pumila*, being quite tiny (reaching only about an inch to an inch and a half) and prone to shyness, is ideally suited for smaller aquariums.

To create a suitable environment for *T. pumila*, provide plenty of plants (including some floating plants) for hiding, subdued lighting, and minimal water movement (i.e., gentle filtration). Good target water parameters include a temperature between 77° and 83°F, a pH between 6.0 and 7.0, and hardness between 5 and 19 dH (source: FishBase.org). In the wild, this species feeds on tiny zooplankton and aquatic insects, so appropriate aquarium fare

would include items such as cyclops, daphnia, brine shrimp nauplii, and mosquito larvae. 🐟

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# Q&A saltwater

## Q Dogface Puffer and Freshwater Dip

I have a small dogface puffer on hold at my local fish store while I set up a 20-gallon quarantine tank for it. I understand that puffers are sensitive to copper treatments, so I'm considering giving the puffer a freshwater dip before placing it in quarantine. Will the puffer tolerate this well?

Bob Forester  
via email

**A** I'm a big proponent of prophylactic freshwater dips and have adopted the habit of doing them on all newly acquired marine fishes right after acclimation and before placing them in quarantine. In many instances, this simple procedure has revealed and killed external parasites (e.g., *Cryptocaryon irritans*) that were not evident at the time of purchase, saving me a lot of hassle over the years.

Your dogface puffer (*Arothron nigropunctatus*) should tolerate a freshwater dip very well. Just make sure the dip water has the same pH and temperature as the water in the specimen's transport bag. Dip the specimen for a minimum of five minutes, monitoring it closely for signs of severe stress throughout the procedure. If the puffer becomes extremely agitated (thrashing violently about, etc.), transfer it immediately to salt water.

Also, try to avoid exposing the puffer to air when transferring it so it doesn't puff itself up with air, which can be harmful if it cannot quickly expel the trapped air. In other words, when moving the specimen from one tank or vessel to another, do so by coaxing it into a container held under water rather than by net.

## Q Hardness in Marine Aquariums

I'm a longtime freshwater aquarium hobbyist, but I'm new to marine fishkeeping and still have a heck of a lot to learn. On the freshwater side of things, water hardness is a very important parameter, but I never hear marine aquarium hobbyists talking about it. Why is that?

Amy Pasodny  
via email

**A** One of the wonderful things about the marine aquarium hobby is that there's always more to learn. In fact, I get the distinct feeling sometimes that the more I learn, the less I know! General hardness isn't really discussed among marine aquarists because, for all practical purposes, the fish and invertebrates they keep all thrive in water of the same composition and chemistry. Appropriate levels of all the dissolved minerals and elements that marine organisms require are included in the salt mixes used to make up synthetic sea water.

However, while general hardness isn't a major concern for marine hobbyists, carbonate hardness (KH)—the measure of carbonate and bicarbonate ions in the water—definitely is an important issue. Carbonates and bicarbonates act as buffers, preventing the pH of aquarium water from dropping when acids are introduced. The higher the KH, the greater the water's buffering capacity (a.k.a. alkalinity reserve). The ability of water to resist a change in pH is very important in saltwater systems where stability of parameters is paramount. Hence, buffering capacity must be replenished frequently in marine systems, either through routine partial water changes using a quality salt

## 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](mailto: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](http://forums.tfhmagazine.com).

mix or through the direct addition of buffering agents. The latter approach (in addition to routine partial water changes) is much more commonly utilized by reef aquarium hobbyists who must routinely supplement calcium and buffers in one manner or another because many of the corals and other reef invertebrates they keep utilize these elements for the production of their skeletons or shells.

## Q Bird Wrasse

Can I trouble you to answer a few questions about the bird wrasse for me? How big will it get? Is a 125-gallon tank large enough for one? Is it peaceful, and will it get along with most other fish in an aquarium?

Mark Gaynor  
Plano, Texas

Actually, there are two different species of bird wrasse, both belonging to the genus *Gomphosus*—*G. varius* and *G. caeruleus*. The one you're most likely to encounter in the US is *G. varius*, which can reach approximately a foot in length. Your 125-gallon tank would be bare-minimum housing for this energetic, fast-moving species. Be sure to provide a lot of open swimming space as well as rockwork caves and crevices in which it can hide and rest at night. I would suggest positioning the rockwork in the center of the tank and away from the sides to allow the wrasse to swim freely around the tank in a circular pattern (or in a figure eight if you create two rock peaks with a gap in between them) rather than having to stop at either end and turn around. Also, be sure to cover the tank completely to prevent this notorious leaper from going airborne and meeting a dusty demise on your fishroom floor.

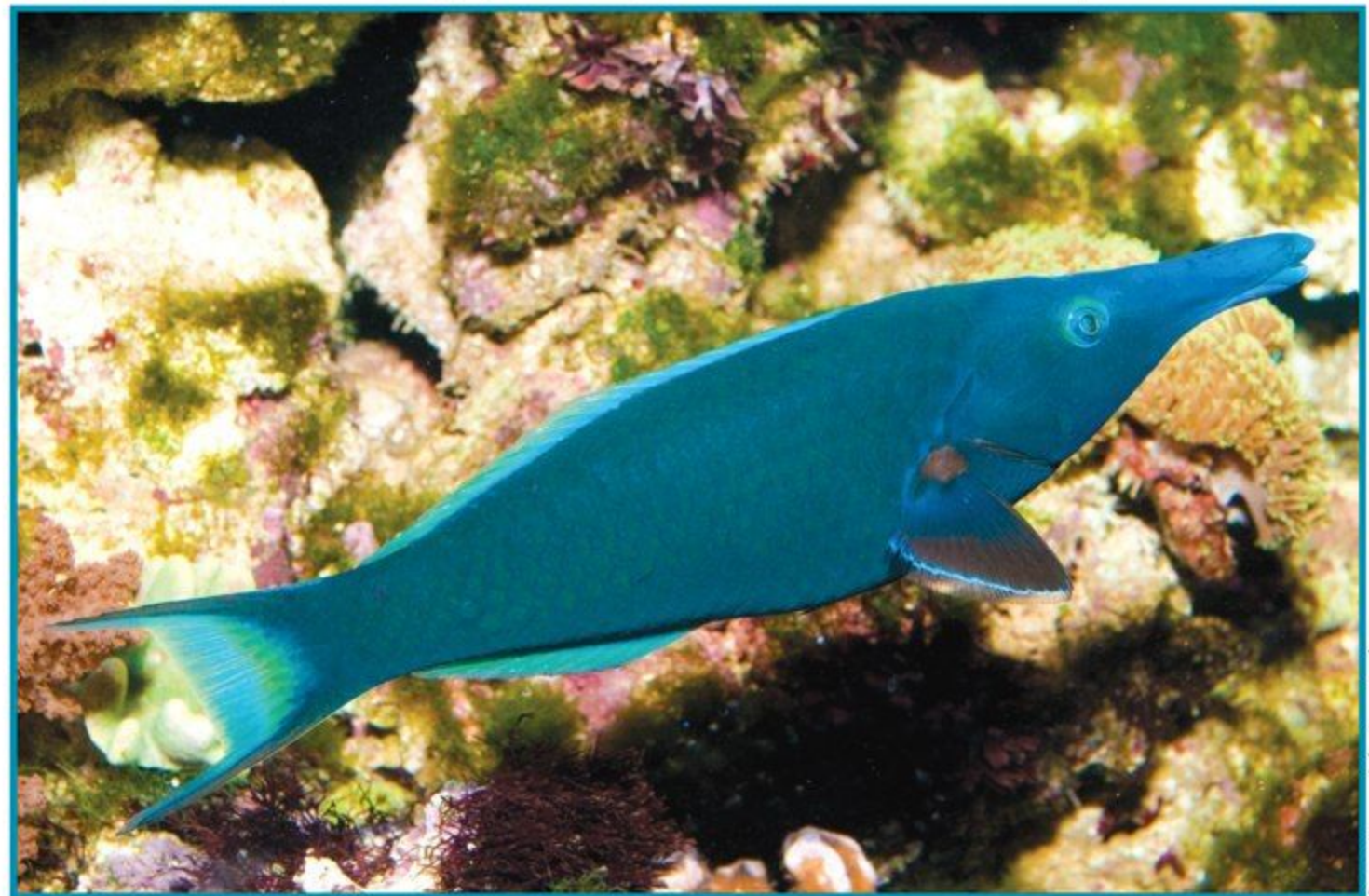
I would not characterize *G. varius* as peaceful. It will eat fishes small enough to swallow and bully or outcompete more passive species. So, choose decent-sized, equally assertive tankmates that can hold their own.

## Q Dry Base Rock

I'm setting up my first reef aquarium and could use some advice on aquascaping. I'm on a tight budget, so I was planning to put down a base of lower-quality live rock (ocean collected but with minimal life on it) and then place some high-quality live rock on top of that layer. But now, a friend of mine has offered to



■ Dogface puffer (*Arothron nigropunctatus*); pufferfish should never be exposed to air.



■ A tight-fitting cover is a must for the bird wrasse (*Gomphosus varius*), which is capable of leaping out of tanks.

give me a bunch of old, dry rocks that were once in his saltwater tank to use as a base. Going that route would save me a lot of money. Is there any reason you know of why I shouldn't use my friend's rocks?

Neil Bergstrom  
via email

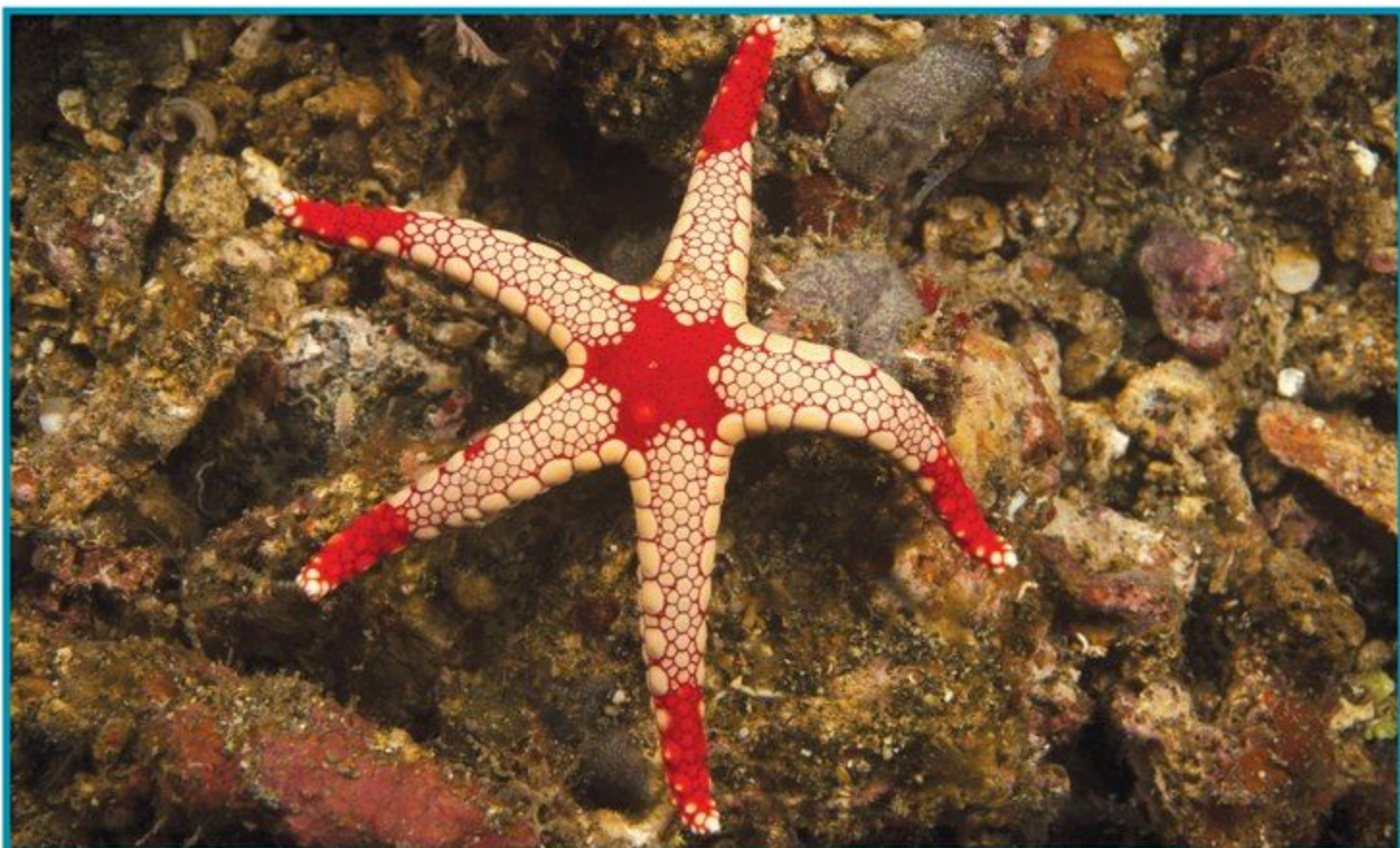
If your friend can assure you that he never treated the tank with any medications—especially copper-based ones—while the rocks were in there and that the rocks have not been exposed to any toxic

substances since he removed them from his tank, they should be safe to use again after some good rinsing.

There is one potential drawback to using old, dried-out rocks versus live rock. That is, since everything on the rocks has died off completely, they are much more likely to harbor nuisance algae if water conditions favor their growth. With live rock—even lower-quality grades with minimal life visible on them—all of the inhabitable niches are essentially occupied by some type of organism, making it more difficult (though certainly not impossible) for nuisance algae to gain a foothold.

Asther Lau Choon Siew/Shutterstock

Iliuta Goean/Shutterstock



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■ One way to determine the health of a *Fromia* starfish is to check how quickly it can right itself after being flipped over.

That being said, you can keep nuisance algae at bay in either case through proper stocking, regular maintenance, robust protein skimming, and careful attention to water quality. Given the fact that you're on a tight budget—and assuming your friend can offer you the aforementioned assurances—I'd say go with the dry rocks!

## Q *Fromia* Starfish Reef Safe?

This morning I was shopping at a local store that specializes in marine fish and invertebrates and a little orange starfish caught my eye. It was identified as a "*Fromia* starfish." Is this a reef-safe species? Also, when I asked the

dealer if the starfish was in good shape, he did a curious thing. He reached into the tank and flipped it onto its back. Before I could ask what he was doing, he was called away by another sales person (the shop was very busy) and never got back to me. Why do you suppose he did that? Anyway, I asked one of the staff to hold the starfish for me, and if this species turns out to be a good choice for my 90-gallon reef tank, I will go back and buy it.

Eric Sickles  
via email

**A** The various *Fromia* species starfish that appear in the hobby are generally considered reef safe. Many are believed to feed on detritus, algal films, and microorganisms, though some are suspected or known to eat sponges. If you have a well-established system with ample live rock to provide grazing opportunities, it would probably be safe to add this starfish—though I would recommend first identifying it to the species level (*Fromia* is the genus) and researching its specific care requirements.

Your dealer flipped the starfish onto its back because a specimen's ability to right

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itself fairly rapidly (for a starfish) after being flipped over is one indication of good health. You'll also want to scrutinize the specimen carefully for evidence of damage or disease.

## Q FOWLR Lighting

Do I need any kind of special lighting for a saltwater tank that contains fish and live rock but no corals? I will be buying the live rock from my local fish store soon, and I want to make sure the nice purple algae that's growing on it survives.

Mackenzie Mitchell  
via email

A You don't need to invest in high-intensity lighting for a fish-only-with-live-rock, or FOWLR, aquarium as you would for a reef system containing photosynthetic corals or other photosynthetic invertebrates, such as Tridacna clams. Whether you choose fluorescent (e.g., T12, T8, T5, or power compact) or LED lamps, any normal-output lighting that appeals to your aesthetic sensibilities and showcases your fish to their greatest advantage will suffice. And, yes, many species of coralline algae—that nice purple algae you mention—will thrive under normal-output illumination. I would, however, encourage you to put your lights on a timer to create a predictable day/night cycle for your fish.

## Q Octocoral and Hexacoral

In researching reef invertebrates, I've encountered the terms "hexacoral" and "octocoral." Can you explain what these terms refer to? Are they individual coral species?

Pat Higgins  
Killeen, Texas

A The terms hexacoral and octocoral don't refer to individual coral species but to all the corals found in the subclasses Hexacorallia and Octocorallia respectively. The hexacorals are the true stony corals, or "scleractinians," and are so named because all the members of this group have polyps with six tentacles (or some multiple of six). The corals responsible for building the world's reefs are among the hexacorals. The octocorals, which include the soft corals, sea pens, gorgonians, and a few other types of coral, all have polyps with eight tentacles.

## Q Tempted by Golden Trevally

My local fish store is selling an awesome-looking gold-colored fish with black stripes called a golden trevally. I'd never seen or heard of one before and was really tempted to buy it for my 90-gallon FOWLR tank. Then, I decided I'd better wait to buy it until I do some research on it. Can

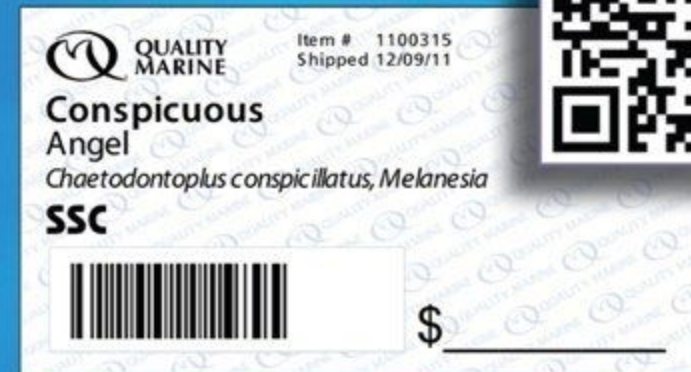
you tell me anything about this species?  
Jackson Pomarede  
via email

A Assuming the fish you saw was, as I suspect, *Gnathanodon speciosus*, it was a very wise decision to postpone your purchase and do further research. Trust me; you won't regret

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■ The golden trevally (*Gnathanodon speciosus*) can grow to 4 feet and is best left for public aquariums.

it! *G. speciosus* is a member of the family Carangidae, the jacks and pompanos. The reason I think you'll be happy to have passed on this fish is that it gets way too large for virtually any home aquarium—approximately 4 feet in total length. To put that in perspective, a full-

grown specimen would fill your 90-gallon tank (assuming it's standard design) from end to end. Really, this species is suited only for large public aquariums. Kudos to you for resisting that urge we all grapple with from time to time to buy a pretty fish on impulse!

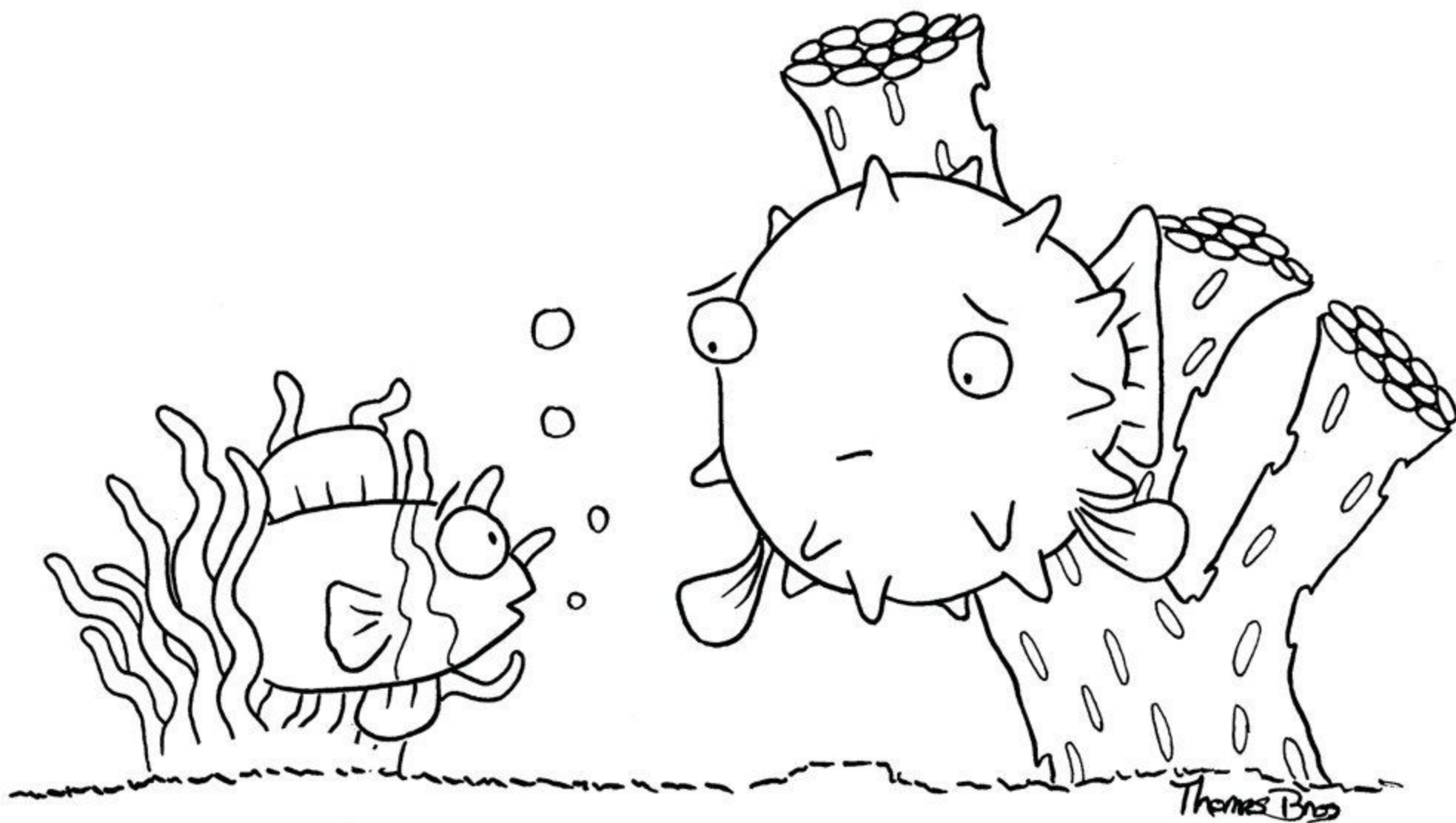
## Q Powder Brown Tang Died

Hello TFH. My powder brown tang recently died, and I can't figure out why. First, let me explain that I am aware there is a big difference between the two species sold as the "powder brown tang" (*Acanthurus nigricans* and *A. japonicus*). I know that *A. japonicus* is much easier to keep and has a much better captive survival rate than *A. nigricans*, and I'm certain beyond the shadow of a doubt that *A. japonicus* is the species I bought. I had it for two months in a 55-gallon tank with a foxface rabbitfish, a threadfin butterflyfish, a pair of common clownfish, a yellowtail blue damsel, a pajama cardinalfish, and a lawnmower blenny. Over the two months, it just got thinner and thinner until it finally died. I thought *A. japonicus* was supposed to be easy. Why do you think mine died?

Dixon Stoll

Atlanta, Georgia

A While it's true, as you note, that *A. japonicus* has a much better track record of survival in captivity compared to *A. nigricans*, I would



"You're right, you do look a little puffy today."

not characterize *A. japonicus* as easy to keep. In fact, based on personal experience, I would rate it as rather sensitive and demanding when it comes to environmental conditions and nutrition.

Without much more history (water parameters, feeding regimen, maintenance schedule, observation of aggressive interactions, etc.), I can't tell you exactly why your specimen died, but I can say that a 55-gallon tank is not sufficiently large for this species, which can reach over 8 inches in length. In fact, your tank is too small for some of the other inhabitants as well—specifically the foxface rabbitfish (*Siganus vulpinus*) and threadfin butterflyfish (*Chaetodon auriga*), both of which reach somewhere around 9 inches in length.

To succeed with *A. japonicus*, you need to provide a mature, relatively large system, say 100 gallons or more, with peaceful tankmates, plenty of open swimming space, rockwork to hide in, vigorous current, highly oxygenated water, and very low dissolved organics. It's also a primarily herbivorous species, demanding frequent feedings of algae-based fare (e.g., dried nori, frozen herbivore formulations, and spirulina).



Pasphotography/Shutterstock

■ The powder brown tang is primarily herbivorous and requires frequent feedings of algae-based fare.

**Q Bristleworm Hunter**

I've spotted several of the dreaded bristleworms in my reef tank, and I'm looking for a good way to eradicate them before they start to eat my corals. Is it true that the banded coral shrimp will hunt down and eat bristleworms?

Leo Zelba  
Flint, Michigan

**A** Yes, it is true that the banded coral shrimp (*Stenopus hispidus*) will eat bristleworms, but before you rush out to buy one and introduce it to your tank, do keep in mind that other motile invertebrates are on this species' menu as well.

For example, if you've got other ornamental shrimps in the tank or a cleanup crew consisting of various hermit crabs and snails, these animals would definitely be in danger of becoming a meal. Of course, you would also want to avoid housing *S. hispidus* with any fish or other animal known to prey on small crustaceans.

I would be remiss if I didn't point out that the presence of bristleworms in an aquarium

is not necessarily cause for alarm. While there are bristleworm species that can inflict a nasty sting and/or feed upon valued invertebrates, e.g., the Caribbean bearded fireworm (*Hermodice carunculata*), most of the bristleworms we hobbyists encounter are actually beneficial scavengers or detritivores. Don't be in a hurry to introduce a control organism unless you're confident that you're dealing with a potentially harmful species. 🐞

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# ask jack

## Dear Jack,

I keep 12 discus in a 100-gallon tank, and all of them look to be very healthy. I feed them flake food as well as frozen brine shrimp. But at all times, they show vertical black bars on their body, which were not there when I purchased them. Please inform me as to why the discus are always showing these bars.

C.T. Shaw  
Troy, New York

## Dear C.T.,

Without sufficient water changes or perhaps due to improper filtration, these discus stress bars can show. This situation can quickly appear as a result of a buildup of ammonia or a nitrite rise in the tank. The problem is not in any way life threatening to the discus.

You have said nothing about general tank conditions: pH, water conductivity, temperature, or the percent and frequency of any water changes. How often do you feed your discus the frozen Artemia and flake food, and in what quantity?

I would begin to make your water changes daily, changing approximately 25 to 30 percent of the water each time. If the stress bars are showing because of poor water changing, then the water changing should show results in several days.

If the fish are still in their growing period, I would suggest feeding once daily unless they are fry of about 20 weeks or less. In that case, they can be fed two to three times per day. If the feedings are heavy, be prepared to siphon all excess food from the tank bottom each evening after the final feeding.

A final thought—a too-low water temperature can result in many discus problems. Attempt to maintain the water temperature of the tank at the ideal temperature of 82°F at all times.

## Dear Jack,

For nearly three years, I've been very successful breeding a number of livebearing tropical fish. Before purchasing these fish, I could see, in many cases, that they were being bred in our local tap water. With the success I have had with the livebearers, I would like to maintain and eventually breed discus. Discus are available in several of our local aquarium shops in all sizes and colors, but I would like to get information as to whether or not they require more care from me than my present fish do. If they do require more care, I will give them that.

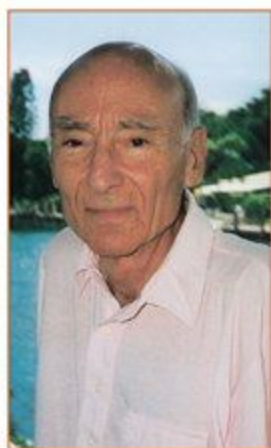
Thomas Willingham  
Akron, Ohio

## Dear Thomas,

I have here a copy of a manuscript I wrote that should give you the assurance you'll need to embark in discus keeping. First-time discus hobbyists need not be immersed in the study of water chemistry. At many of the discus seminars where I give presentations, I've seen potential discus enthusiasts frightened away from the hobby after listening to the speaker go into minute detail concerning water chemistry.

Successful discus keeping is not at all the scientific endeavor that some people are led to believe. We monitor calls and emails

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

concerning discus, with many coming from hobbyists informing us of their success using nothing but the local municipal water supply. Others tell us of their use of either reverse osmosis or deionization for conditioning their discus water, when, in many cases, neither would be necessary in their locality. Let's assume that you will be using either RO water or your local municipal water. I don't know what kind of water you have, but it is probably like Cleveland water, which is fine for discus. I was originally from Cleveland but left—as Lebron James left Akron—for sunny South Florida.

You have probably already purchased the very necessary water-testing kits for pH, water hardness, chlorine and chloramines, ammonia, nitrite, and nitrate. If not, all of these kits can be obtained in any aquarium shop at minimal cost. The pH test kit will most likely be the type using either a liquid reagent or disposable strip paper probes. These paper probes are very easy to read, as well as efficient, whereas the kit using the liquid reagents takes more time to read but is generally more accurate.

The liquid reagent pH test kit will measure pH in the range of 6.2 to 7.5, certainly in the range of most tropical fish, including discus. The reagent is bromothymol blue. For a lower pH reading, methyl red is the reagent, available in any chemical supply house. There are many other pH test kits available that are more expensive, but for the beginning discus hobbyist, as well as for most other aquarists, the above-mentioned inexpensive pH kits will yield good results.

What pH do we want to obtain in our discus tanks? Most discus keepers, hobbyists, and commercial breeders maintain a pH of 6.0 to 6.5, both readings being on the acidic side, with pH 7.0 being neutral and anything above 7.0 being less acidic (alkaline). Many South Asian breeders of discus and other Amazonian tropicals successfully raise their fish in 7.0 to 7.4 waters.

If your pH water absolutely must be lowered, however, there are several methods of doing so. If you have soft water with no buffering capacity, the pH can very easily be lowered effectively by the use of high-quality peat. Not only will quality peat lower the pH in soft or semi-soft water, but it will also remove some carbonate hardness. On the other hand, if the water being treated is hard with a high conductivity,



■ Stress bars on discus may indicate problems with water quality or filtration.

the peat will accomplish virtually nothing. Unknown to many tropical fish hobbyists is that peat in the aquarium has a very short life span, depending, of course, on the amount circulating through the filter. Hobbyists tend to leave the peat in aquarium filters much too long, the result being that the humic- and tannic-acid-producing properties have long since leached out into the water.

How is the peat to be placed in the tank water? It must be dampened first, placed into a fine-mesh bag to prevent dispersal throughout the tank, and then positioned in the filter, allowing the water to flow through it.

You can easily determine how long the peat is effective with your pH test kit. For example, if you have been able to reduce the pH from 7.5 to 6.5 by using the peat for several days, and the pH is stabilized at 6.5 and not dropping any lower, you can be certain the peat is exhausted with no more acidic properties. What if the pH has dropped below 6.5 or even 6.0? We have had

situations where the pH has dropped as low as 5.0! Is that bad? Not really. A pH reading of approximately 5.0 to 5.5 is like having an insurance policy in your aquarium water for two reasons. One, *pseudomonas* and *aeromonas* bacteria cannot thrive at such a low pH. Two, if there are traces of ammonia in the tank water, they will be in the form of ammonium, which is basically not harmful to aquarium fish.

Discus, in their Amazonian streams, spend their entire lives in soft, acidic waters, waters at times that could be classified as nearly 100 percent rain water. Is it necessary to attempt to duplicate these conditions in our aquariums? Not at all. Inexpensive water hardness kits are available in aquarium shops. You can also determine very quickly if your local municipal water is soft or hard when washing your hands with soap and water. If the water is hard, with many mineral salts, it will be difficult to get a good soap lather, whereas soft water will produce a good lather with the soap. 🐟



# cichlid world

## Learning the Hard Way: Preventing Ich in the Aquarium

Cichlids are fascinating for so many reasons. The brilliant colors they display are matched by their colorful personalities. These colors often intensify and change in remarkable ways when they are breeding and guarding fry. Once hooked by cichlids, hobbyists often want to keep and breed as many different species as they can to experience all the varieties of cichlid colors and behaviors.

In the search for the next best species of cichlid, it is easy to forget that cichlids, like all fish, are prone to many diseases. This forgetfulness arises because cichlids are generally a hardy bunch. Being secondary freshwater fish, thought to be descended from saltwater relatives, they usually adapt to a wide range of water conditions. This is not true for primary freshwater fish, such as barbs of the cyprinid family. The ability of cichlids to tolerate a wide range of water conditions is why they have successfully colonized acidic blackwater habitats in the Amazon and alkaline waters of the African Rift Lakes.

So when new cichlids are acquired, most of them adapt well to whatever water conditions are coming out of our tap water. While wild cichlids from the extreme ends of the aquatic spectrum generally do fine, they may need some special manipulation of their water to induce them to breed. It is not so much the absolute values of pH and alkalinity that can affect cichlids negatively, but rapid changes in these factors. That is why it is important to acclimate your new cichlids by floating the bag in the tank and gradually adding tank water to the bag to get them used to

your water chemistry, even more so than its temperature.

There are only a few diseases that the cichlid hobbyist normally has to deal with. Wild fish usually have external parasites, such as lice, flukes, or leeches, that need to be removed. Smaller parasites, such as monogeneans, also called flatworms, and dinoflagellates, which cause velvet, may make an appearance and need to be treated. There are also internal parasites, but these are difficult to identify without a microscope, and their treatment is often hit or miss without an accurate diagnosis.

Tank-raised fish are often especially easy to keep. There are hundreds of cichlid species that are bred in captivity. These are often more desirable simply because they do not carry the wide variety of parasites found on nearly all wild fish. When obtaining fish from a large chain store or your local fish shop, it is still a good idea to give them a good looking over to see if they are itching or scratching or have white spots on them, which is often a sign of the common external parasite *Ichthyophthirius multifiliis*, also known as ich.

An even better source of usually disease-free cichlids is your friend, the local breeder. You can usually find one by joining a tropical fish club. This method of obtaining a species new to your fishroom usually ensures that the new fish you are bringing home are free of disease.

### An Ounce of Prevention...

Lulled by all this logic into a sense of complacency, I brought home a dozen

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

*Etroplus maculatus*, the orange chromide. The 1-inch fry were obtained from a local breeder at a club auction. The only instructions I received were that they did not necessarily need salt in their water, but they would appreciate some alkalinity and a high pH.

I brought them home and unceremoniously plopped them into a 10-gallon tank by themselves. I used my moderately soft tap water, which has about 130 ppm total dissolved solids and a pH of around 7.5 out of the tap. It does not take long for the pH of my tap water to crash, since there is little alkalinity in the water, so I put some crushed coral in a box filter, which, as it dissolves, slightly hardens the water and helps keep the pH above 7.0.

About a week later when I actually paid attention to the little guys, I noticed they had white spots all over them: ich! I had not seen it in my fishroom for so long that I practically forgot what it looked like. However, it had been common in the fish store I owned, and I often had to treat fish before I could sell them. Ich is a persistent and hardy parasite. But it can be controlled, usually by raising the temperature, adding salt, and using a commercial medication.

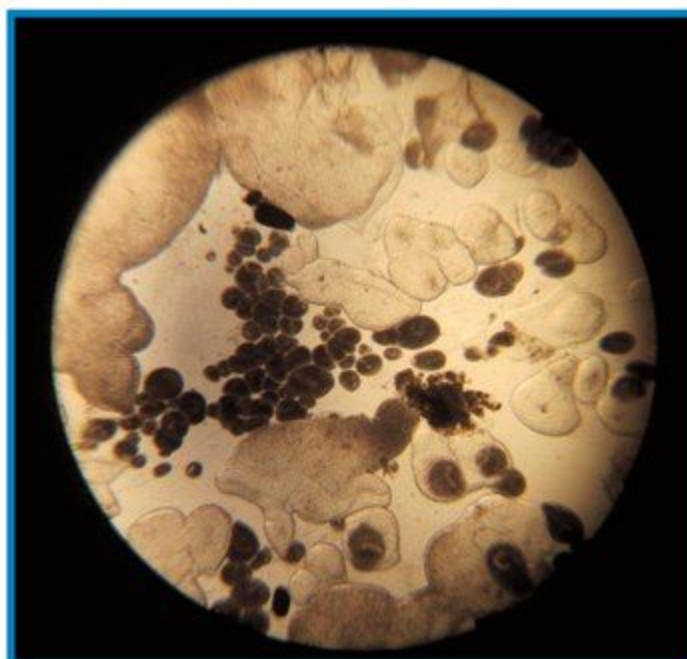
## Treating Ich

The increased temperature speeds up the life cycle of the ich, making it fall off the fish faster. You cannot kill it when it is embedded in the fish. It first grows for a while and then falls off. On the tank bottom, it forms a cyst. Inside the cyst, cell division occurs, turning one parasite into many. When the free-swimming parasites hatch out of the cyst, they begin looking for a host, and this is when they are vulnerable and can be killed. The increased temperature also helps the fish out by increasing the activity of its immune system. Fish that have been exposed to ich can acquire immunity, making them resistant to further infection, but this immunity may wear off after a while.

The salt inhibits the ich and also helps the infected fish out by increasing the osmotic pressure in the water. A severe ich infection can lead to many small holes in the fish through which the salts of the fish's body can leach out. Cichlids and all freshwater fish rarely drink water because the salts in their bodies are in a higher concentration than those in the water. They actually expend energy preventing their bodily salts from leaking out through



■ A *Vieja microphthalmus* (center) infected by ich.



■ Under magnification, ich appears as black blobs that are round or oval in shape.

their gills. So, the salt added to the water pushes back and keeps the fishes' salts from leaking out of the fishes' wounds. The salt is also a minor irritant and may cause the fish to secrete an extra layer of mucus over their skin, which can then help prevent any free-swimming ich parasites from attaching to the fish.

Commercial preparations that contain the dye malachite green and the preservative formalin seem to be the most effective. Methylene blue has little effect on ich and is more effective for preventing fungus on fish eggs. Sometimes your local fish store may stock straight formalin, and this can also be used successfully.

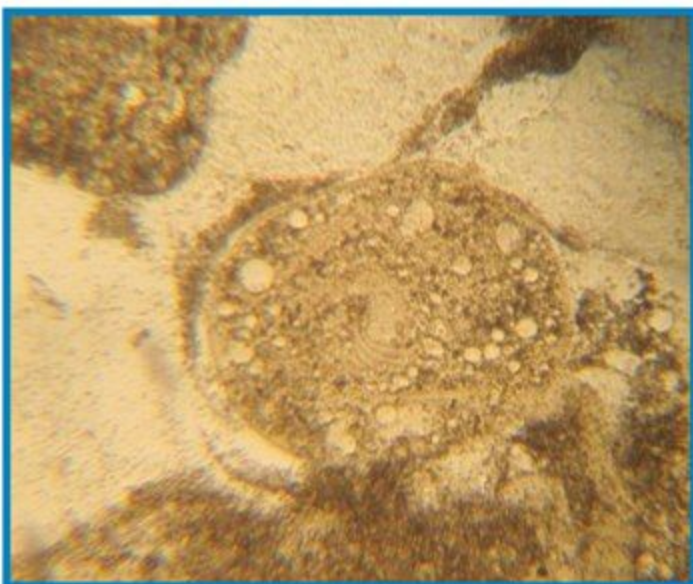
But back to the orange chromides. It was summer and the garage was hot, so I added some salt, about a tablespoon per gallon, and some anti-ich drops as directed. After a week or so, the orange chromides looked better.

## Round Two

Summer came and went, and soon it was getting cold in the garage. While I focused on getting my tanks connected to a recirculating filter system, the ambient temperature dropped and my water temperature fell into the 60s. As usual, the algae was pretty thick on the front of the glass. I noticed one day that some fish didn't seem as interested in food as they usually were, and as I scraped off the algae to get a better look, I made a vulgar exclamation. They had ich!

The tank held eleven *Vieja microphthalmus*, five *Thorichthys pasionis*, a *Cryptoheros sajica*, and an *Aulonocara baenschi*. One of the micros was dead, and another was absolutely covered with ich, as was the *sajica*. A few other fish had some spots. In the tank below were fish with some spots, but other cichlids in the system had either a few spots or none. There were three 100-gallon, two 40-gallon, and seven 20-gallon tanks on the system that included 90 gallons of water in the sump, a total of about 600 gallons. What a headache to treat all those fish!

Out came the six heaters I could find, 250 watts each. I dropped them in the sump and raised the temperature to 86°F. I added a teaspoon of salt per gallon that first day, 600 teaspoons (which is 200 tablespoons, at 16 tablespoons per cup, or 12½ cups of salt). This brought the salinity to 1.5 parts per million (ppm). I used two 50-pound bags of rock salt over the next 10 days as I raised the salinity to 5 ppm. Any salt that people can eat is okay, even



■ Ich parasites degenerating after successful treatment.

if it has iodine. I added 50 milliliters, or 0.8 milliliters per 10 gallons, of formalin to the system each day after I did a 25 percent water change. The increased temperature, salt, and formalin disrupt the biological filter to some extent, creating a bunch of organic debris in the tank that needs to be removed. Eliminating this debris may also remove ich living in the substrate. I added some extra airstones to make sure there was plenty of oxygen in the water.

The ich was thick on the sajica, and he perished. All of the other fish eventually

recovered. Where had the ich come from? I may have spread it around when I obtained the orange chromides, or I may have had it all along. In large systems, a few ich parasites floating around will usually go unnoticed. A low background infection can be maintained when most of the fish have immunity and are resistant to infection. Another place that ich can hide is on the gills. It may sit there hidden until the fish is stressed one day, which signals the ich to come out of dormancy and begin the reproductive cycle. Then when the free-swimming ich parasites come out seeking a new host, the stressed fish have lost their immunity and become susceptible to infection.

The tank that was most affected was the most crowded, had the poorest water quality despite being on the recirculating system, and was undoubtedly the most stressed. The temperature drop may have been the straw that broke the camel's back. The micro that perished was a smaller female, and the sajica was always getting picked on. Somewhere around this time, the male *baenschi* also disappeared.

### Prevention Is Key

I remember ich being a nuisance years

ago, causing a few spots and making fish itch, but it was rarely fatal. It seems there is a more potent strain now, which I have been known to refer to as "super ich." This more virulent ich seems to appear overnight and is more like the plague than the common cold. The photos show many ich cysts in the mucus from the fish. This makes me wonder if the cysts don't fall off the fish but merely come loose, multiply in the slime layer, and readily reattach to the fish, making them harder to treat with less intensive methods.

But the bottom line is something like this: Quarantine new arrivals in the fishroom. It also doesn't hurt to add a powerful dose of ich medicine for 10 minutes to any bags of new fish you bring home as they are being acclimated and then discard the water in the bag afterward. Try to maintain biosecurity by keeping equipment and supplies for fish in quarantine separate from your healthy fish. Even then, maintain good water quality and temperature and provide an environment with the least stress possible. Strive for happy fish, and you will find happiness too. 🐟



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# into the labyrinth

## Kissing Gouramis

I have a big problem with the kissing gourami, but don't get me wrong. There's nothing inherently bad with this fish, but I have an issue with it nonetheless. Or, perhaps, it would be more accurate to say that my beef is with the dealers who sell kissing gouramis to unwitting hobbyists who are incapable of housing and maintaining them properly. It's my firm belief that kissing gouramis purchased on impulse are responsible for more people leaving the aquarium hobby than any other species.

### Considerations for Kissers

#### TANK SIZE

When kept by hobbyists who properly provide for their needs, kissing gouramis (*Helostoma temminckii*) can be interesting fish to maintain and serve as a breeding challenge. What do they need? First and foremost, they need space—lots of it. Kissers can easily grow to 10 to 12 inches in length, so the bare-minimum tank size for them would be 75 gallons, and that is really stretching the lower end of the tank scale. A much better tank would be one that is 24 inches front to back and as long as possible. The height is not as important as the base dimensions.

#### DIET

The second consideration is diet, which should be as varied as possible and include some greens as well as animal-based proteins. A combination of pellets intended

for herbivores as well as pellets intended for carnivores should be fed along with a wide variety of frozen foods. Flake foods will work well for smaller specimens, but as they grow, pellets will be a better choice. Pellet size should correspond to mouth size, with larger pellets being offered as they grow.

#### WATER PARAMETERS

The third consideration is water quality. Because kissers grow large and have healthy appetites, the filtration should be heavy and probably oversized for the tank. Water chemistry is not important as long as extremes are avoided. Temperatures anywhere from the low 70s to the low 80s will be fine. Accounting for these three factors will go a long way toward ensuring success with this species.

#### TANKMATES

The aquascape should include a few places to hide and lots of open room for swimming. Hiding places are important so less dominant individuals can escape the notice of dominant fish if the need arises. While we're on the subject of dominance, let's look more closely at the kissing behavior of the fish. The kissing is essentially their version of wrestling to see who is dominant. Once a dominance hierarchy is established, the frequency of kissing diminishes significantly.

When it comes to housing other fish with them, potential tankmates should be robust enough to take care of themselves without

Mark Denaro has been keeping freshwater aquariums since 1970 and marine aquariums since 1976. He currently operates Anubias Design ([www.anubiasdesign.com](http://www.anubiasdesign.com)), an aquarium and terrarium design, installation, and maintenance company serving southeastern Pennsylvania, and importer/online retailer of new, rare, and interesting freshwater fishes, invertebrates, and plants. A former president of the International Betta Congress, Mark's primary interests are anabantoids, cichlids, and planted aquariums.



mark denaro

being aggressive or territorial enough to pose a threat to the kissers. Other large gouramis, such as moonlights (*Trichogaster microlepis*) and snakeskins (*T. pectoralis*), make good choices. Larger schooling cyprinids of many species are appropriate, and most peaceful cyprinids that grow to lengths of at least 5 to 6 inches will work. Many characins and their relatives of similar size and temperament are also good choices.

Medium to large cichlids that are not overly territorial can work quite well with the kissers. Most of the best choices will be among the larger yet fairly peaceful cichlids of the New World. Larger geophagines, the *Mesonauta* species, and similar species will usually get along pretty well with kissing gouramis. Among Old World cichlids, the best choice is probably the peacocks, whose males will add a nice splash of color to your tank.

Of course, there are also many catfish that can be mixed with kissers, such as the larger loricariids, most of the *Synodontis* species, and many of the doradids and *Mystus* cats. A nice school of angelicus cats, *Pimelodella pictus*, or similarly sized pimelodids would also work. The previously described decor and diet will be adequate for most of these species as well.

## Spawning

*Helostoma temminckii* is interesting from a taxonomic standpoint because it is the only member of the family Helostomatidae. It differs from other labyrinth fish in several ways, but of most interest and impact for



■ Kissing gourami (*Helostoma temminckii*).

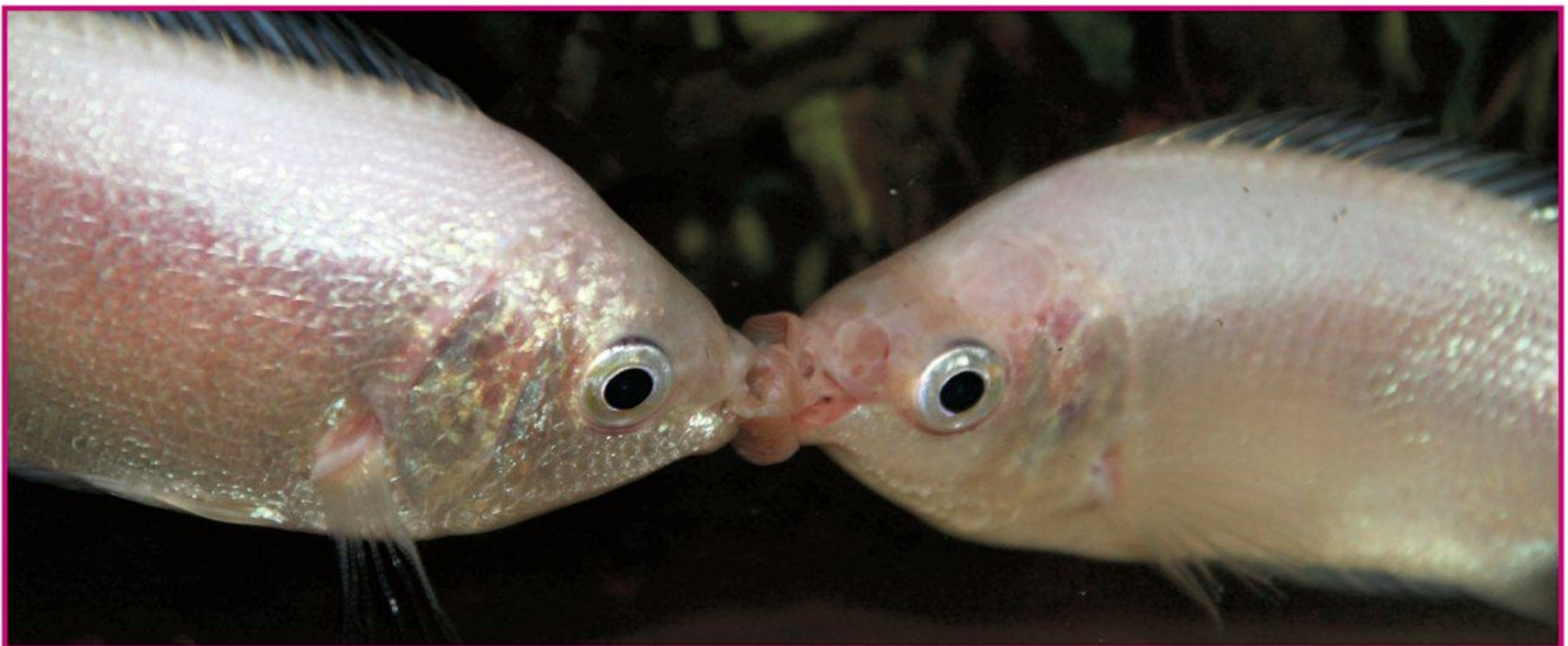
aquarists is the spawning method. Inducing spawning is not easy, and it is a challenge even for advanced hobbyists. Part of the challenge is raising the fish up to adult size/age, which requires a fair amount of space as well as patience. The fish need to be around 5 inches in length or larger and at least a year old.

While *H. temminckii* may blow a few bubbles, it does not build a bubble nest and isn't a mouthbrooder. It is an egg scatterer. The pair does perform the classic labyrinth fish embrace, but upon release, the eggs rise to the surface due to the presence of an oil droplet inside the egg. No further brood care is practiced by either adult.

This is a large and prolific species, with large females capable of producing

10,000 eggs or more each time they spawn. Spawning is best accomplished in large tanks or indoor ponds with base dimensions of at least 6 by 2 feet. Differentiating the sexes is extremely difficult and only possible visually when the female's abdomen starts to fill with roe. At that point, the male and female should be separated for a couple of weeks and fed well and heavily. When they are put together in the spawning tank, they should spawn within a day or so. The adults should be removed after spawning.

I believe that the best way to spawn them will be to put the pair into an outdoor pond in early summer. The fry require infusorians as a first food. There should be a profusion of food in the pond that will help to ensure a higher survival rate for the fry while, at the



■ The kissing behavior seen in *H. temminckii* occurs as a means of establishing dominance.



■ Though commonly sold as a beginner's species, the kissing gourami is a better choice for advanced hobbyists interested in a spawning challenge.

same time, not requiring a tremendous deal of work by the breeder. Establishing a thriving daphnia culture in the pond prior to spawning will also be beneficial and provide another food source for the growing fry. Supplemental feeding with prepared foods will be enjoyable for the hobbyist and beneficial to the fish. The young can be removed at the end of the summer.

The hobbyist should be able to estimate the number of juveniles in the pond and

hopefully make arrangements to sell them to an area wholesaler when they are removed. Trying to sell them in small batches to shops or other hobbyists may result in a higher price per fish, but if the entire brood can be sold in one shot, the lower price is definitely worthwhile.

### Kissing Gouramis in the Wild

Kissing gouramis are quite popular food

fish in their native Southeast Asia and are widely cultured for food. Some of these make their way to exporters for sale in the aquarium trade. They are also widely cultured in Florida fish farms. Their native range is slow-flowing rivers in Cambodia, Indonesia, Malaysia, and Thailand. *H. temminckii* has been cultured as a food fish in a number of other countries, and escapees have established breeding populations in the Philippines, Singapore, Sri Lanka, and even Colombia. The typical food in farming operations is fresh pig manure, which provides a surprisingly vitamin-rich diet, but it, needless to say, isn't practical for use by the home aquarist.

The pink color form most often sold for aquariums is not the wild pattern. The wild fish is a solid silvery green, not nearly as attractive as the pink variant. Marbled forms of both the green and pink patterns also exist, with large black blotches overlaying the base color. Unfortunately, this species is also available dyed in a variety of colors or even tattooed with symbols or words. These practices should not be supported, and dyed and tattooed fish should never be purchased. A number of the fish that undergo these processes do not survive the stress they induce.

Understanding kissing gouramis leads to an appreciation for them. Dislike can be overcome with education. Don't look down on this as a beginner's fish because, while it isn't a good fish for beginners, it is, in fact, an interesting and challenging species for the advanced hobbyist. 🐟

Northern Nevada

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# life with livebearers

## The Blue Gambusia (*Gambusia punctata*)

There are a whole host of livebearers that are rarely, if ever, seen in the hobby. The various species of *Gambusia* are almost never available except through clubs like the American Livebearer Association (ALA, to join go to <http://livebearers.org>). This month, I'm going to take a look at an uncommon species we maintain in our hatchery: the blue gambusia (*G. punctata*).

I got this species from Ivan Dibble, to whom I'm dedicating this column. Ivan, who died December 25, 2009, gave me *G. punctata* at the ALA's May 2008 convention in San Antonio, Texas. Ivan and I had corresponded about livebearers many times. The last message I got from him was on December 24, 2009. It was an online Christmas card.

Ivan visited our hatchery in May 2008 with a group of fellow ALA members. While walking through one of our greenhouses taking photos, Ivan stepped on a weak board on the walkway and fell, with his brand new camera, into a 300-gallon vat. Despite his camera being destroyed, Ivan took the fall with good humor. That was Ivan.

Having founded Fish Ark Mexico, Ivan played an important role in the preservation of rare and endangered livebearers. For more information about Ivan and his work, please go to [www.saudicaves.com/mx/ameca/ivan.html](http://www.saudicaves.com/mx/ameca/ivan.html).

### The Genus *Gambusia*

Ivan gave me *G. punctata* in the hope that I'd keep the fish in the hobby. *G. punctata*, besides being known as the blue gambusia, is also known as the Cuban gambusia and spotted gambusia.

It is unusually attractive for a member of its genus, which contains mostly ugly, grayish fish.

The genus, according to the Integrated Taxonomic Information System, has 43

species, some of which are now extinct. The extinct species were endemic to headwater springs in Texas (at last count, there were 11 species in Texas, including the widest-ranging species in the genus, *G. affinis*). When some of the springs dried up due to pumping or were inundated by dams, these fish disappeared.

I hope to review the US *Gambusia* species eventually, including the extinct species. One species, *G. clarkhubbsi*, is among the most recent vertebrates to be discovered, having been described in 2003. It is found only in a single spring near Del Rio, Texas. In addition to Texas, *Gambusia* species range around the Gulf of Mexico and the Caribbean Sea. One species, *G. affinis*, ranges up to the Great Lakes in North America. It has been introduced to every continent worldwide, except for Antarctica, for mosquito control to the detriment of many local fish species. Members of the genus are mostly small, grayish fish with females that are up to 3 inches in length and males that are about 2 inches. Most are smaller than that.

### *G. punctata*

*G. punctata* is the type species for its genus. This means it is the species best exemplifying the genus *Gambusia*.

A native of Cuba, *G. punctata* ranges across the island nation in freshwater streams, ponds, and lakes. I have been unable to find any references to introductions, although FishBase states that *G. punctata* has been reported in southern Florida, apparently making its way there by crossing the Florida Strait. If so, the fish can tolerate marine conditions. As is expected of a fish native to Cuba, it is considered a tropical species and is not cold tolerant. As with all *Gambusia*, it is a voracious eater of insect larvae and any animal that can fit into its mouth. It feeds mostly at the water's surface. Also, like

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



charlesclapsaddle

photographs by the author

other *Gambusia*, *G. punctata* is combative and aggressive.

Females produce 20 to 40 fry at monthly intervals. The fry can immediately take small crustaceans, such as *Daphnia*, *Cyclops*, and other zooplankton. Adults are gregarious, forming loose shoals consisting of both sexes. The adults will eat any small fish, including fry of their own species, and have to be considered cannibalistic. Adult females reach a size just under 3 inches, while the males can approach 2 inches.

*G. punctata* is one of the more attractive *Gambusia* species. Both sexes sport baby-blue eyes and a bluish body sheen, especially on the ventral (bottom) half of the body, hence the common name blue gambusia. And, as its scientific name implies, adults have lines of dots on the dorsal (top) half of the body. These lines are formed by dark edges on rows of scales. There are also lines of dots on the dorsal and caudal fins. Both sexes show a pale yellowish-orange color on the dorsal, on the nearby body, and behind the gills. The stomach is white.

The male's gonopodium is carried pointing downward instead of folded against the body. In imitation of the male, the female has elongated first rays on the anal fin, which also point down. All in all, this is a pretty fish with an active and combative attitude. In the aquarium, *G. punctata* moves with quick, jerky, darting motions, naturally drawing the observer's eye.

## Breeding the Blue Gambusia

Now that we've covered some of the natural history of the species, let's talk about how we keep them in our hatchery and how hobbyists might keep them in their fishrooms.

We raise *G. punctata* just as we do other livebearers we keep, in 50-gallon vats in greenhouses. We use plant filtration and water recirculation to maintain water quality. To maintain this species and to produce fish for sale, we use a three-vat rotation consisting of a breeder vat, a juvenile vat, and an adult (sale) vat.

To begin a rotation, we set up a vat with six males and about forty females. In the center of the vat, we place a cage, which provides refuge for the fry. The adults are voracious fry eaters, but the smarter and faster fry quickly find shelter in the cage and survive. The fry are helped by their mothers who seek out places with nearby cover to deliver, and the cage supplies that cover. I've also noticed, as with many fish, that once the adults are



■ The blue gambusia (*Gambusia punctata*) is named for its blue eyes and body sheen.



■ *G. punctata* may be fed floating pellets or more traditional fare such as flakes.



■ An effective setup for breeding blue gambusia would include a cage, which would allow the fry refuge and the hobbyist to easily net out progeny.

habituated to the presence of fry, they often cease treating them as food.

After about two months, the oldest fry are getting large enough to eat their younger brethren, so the adults are netted out and, along with the cage, moved to an adjacent vat. The fry and juveniles remain in the first vat to grow up. At the end of the next two-month period, the adults and cage are moved to the

third vat, again leaving fry and juveniles in that vat. In the meantime, the fish in the first vat have matured and can be sold.

At the end of the third two-month period, the remaining adults in the first vat are moved to the second vat, where those juveniles have grown into adults. The breeders and cage are then moved into that first and now vacant vat. In summary, we use three vats, cycling the

breeders in sequence through the vats. With luck and some marketing, we sell the adults as fast as we produce them. If not, they make wonderful cichlid food, and our cichlids are always hungry. When we move the adults to the next vat, we cull rigorously, discarding any weak, deformed, or atypical fish. This maintains a healthy population of fish to sell.

With each move of the breeders, we replace any sickly fish and casualties with young, healthy specimens. We keep older breeders as long as they are healthy. In fact, we prefer older breeders. Why? An obvious reason to retain older females is that they produce more fry than younger females. But the real reason for keeping older breeders is that it helps select for health and longevity. Healthy fish tend to live longer, so longevity indicates health. By retaining long-living, healthy breeders, we are improving the overall health of our population of the fish and are selecting for long-lived fish.

When culling sale fish and selecting breeders, we always remove any unusually colored and shaped fish. In order to maintain the species as it appears in nature, we avoid deviating from the wild form and color. If an interesting fish appears, let's say a veiltail,

I segregate it and breed it to see if the trait is heritable. If it is and it's attractive (read: commercially viable), I would then set up an entirely separate breeding colony. I never allow any of the descendants of that fish to be placed in our *G. punctata* breeding colony.

### Caring for *G. punctata*

We feed *G. punctata* the same foods that all of our livebearers receive. In the summer, first thing in the morning, they receive 42-percent-protein floating pellets to nibble on as they wish. In the late morning, they are given a feeding of flakes. In the early and late afternoon, the fish are given 50-percent-protein crumbles of the appropriate size for the fish: Fry and juveniles get 1-millimeter (mm) crumbles, young adults get 2-mm crumbles, and the largest adults and breeders are fed 3-mm crumbles.

In the winter, the early afternoon feeding is skipped due to the shortened day length and somewhat lower water temperatures. All of our fish are raised in greenhouses under natural light, and the greenhouses are cooler in the winter than in the summer. Fish don't eat as much when the temperatures are low and the day length is short. We used

to feed live foods such as *Moina macrocopa* (a miniature *Daphnia*), *Daphnia magna*, and microworms to our livebearers, but we found that livebearers don't require them because the prepared diets we feed provide all the nutrients livebearers need. We reserve those live foods for rainbowfishes and cichlids.

The hobbyist who wants to raise *G. punctata* and its congeners (fish in the same genus) doesn't have to build greenhouses and raise them in vats as we do. He or she could maintain a small breeding colony, maybe one male and six females in a 10- or 20-gallon aquarium. By using an appropriately sized cage as a fry refuge, he or she could simply net out their progeny as they appear and move them to another aquarium to mature. Rather than feeding floating pellets as we do, the hobbyist could use traditional tropical fish foods. While we don't feed live foods, *G. punctata* would certainly appreciate an occasional feeding of newly hatched brine shrimp or similar live food.

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

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# going nano

## The Story of Two 5½-Gallon Tanks

Even by nano aquarium standards, 5½-gallon tanks are considered on the small side. Such a low volume severely restricts the choice of livestock you can keep and what aquascaping can be performed. Despite these seemingly strict limitations, however, two hobbyists have shown that creating an interesting 5½-gallon tank might be more possible than you think.

### J.B.'s 5½-Gallon Planted Tank

J.B. Toellner, who is a moderator on the *TFH* Forum, has about 30 years of experience in the aquarium hobby. It all started with his dad's tanks when he was a kid. According to J.B., "I'm interested in all facets of the hobby and will eventually experience each of them: freshwater, brackish, marine, ponds, paludariums—all in due time."

One of his many desires was keeping freshwater dwarf shrimp. "I've always had an interest in keeping dwarf shrimp and only recently acquired some from a fellow hobbyist. I've had this 5½-gallon tank sitting around, so I decided it would be the perfect home for these cherry red shrimp. As with all of my tanks, I try to recreate nature as best I can by using real plants and natural wood and stones."

### EQUIPMENT

Due to its small size and low-tech nature, the 5½-gallon shrimp tank does not have much in terms of equipment. It is seated on a medium-density fiberboard stand that J.B. created himself and painted with stone-textured spray paint. Included

in the tank is a 7½-watt preset submersible heater to keep everything warm enough for the shrimp. There is a 100-gallon-per-hour hang-on filter on the tank with a foam prefilter over the intake to prevent any shrimp from getting sucked up. As far as lighting is concerned, the tank is shallow enough to require only a single 10-watt, 6500K screw-in compact fluorescent bulb, which is kept on for 9 hours per day and controlled by a timer.

### AQUASCAPING

The substrate consists of a mix of pool-filter sand, black sand, and blasting sand. Above the sand is a large piece of driftwood that juts outside of the plants, drawing viewers' attention immediately. There are also several sizes of river stones placed around the driftwood and plants.

The plants J.B. used are dwarf hygro (*Hygrophila polysperma*), Java fern, *Anubias nana*, and *Cryptocoryne parva*. The foreground is kept generally clear, and the plants are grouped as a jungle in the back around the driftwood.

### MAINTENANCE

The tank has an impressive track record, with no ammonia, nitrite, or nitrate, although this could largely be due to the fact that the tank houses only the red cherry shrimp and no fish. The pH of the tank is 6.2, the KH is 40, and the GH is 150 ppm. It is kept at a warm temperature of 81°F.

The low stocking level, combined with the relatively hardy and undemanding plants, offers another advantage, in that the tank is relatively easy to maintain.

Shari Horowitz is a graduate of Douglass College at Rutgers, the State University of New Jersey, where she earned a BS in Marine Biology. She conducted a study on ocean acidification and copepods of the Great Barrier Reef at Heron Island off Queensland, Australia for her honors thesis while at Rutgers. She has written and edited for the *Daily Targum*, the Rutgers student newspaper, as well as for the *Times of Trenton* in Trenton, New Jersey. Shari is an avid scuba diver and has kept aquariums for most of her life.



shari horowitz



■ Despite its small size, J.B.'s 5½-gallon tank manages to include a substantial combination of livestock and plant life.

J.B. conducts a 30 percent water change on a bimonthly basis and adds only dechlorinator to his tap water for the replacement water. During those water changes, he rinses the sponge and floss from the filter in siphoned tank water.

The shrimp are fed a mixed diet of sinking pellets formulated for cichlids, tropical flakes, and algae discs on a regular basis.

"Truth be told, I don't believe I'd change anything I did with setting up this tank. I always wanted to keep dwarf shrimp, and my goal was to use plants, wood, and substrate to make this nano setup look larger than it is—I believe I accomplished that," J.B. said.

### Butch's 5½-Gallon Reef

Butch Cassidy, another member of the *TFH* forum and one of J.B.'s best friends, took a 5½-gallon tank and went in the opposite direction—he made it into a reef. "This is my first venture into the salty side of the hobby, and I'm always interested in the challenges of do-it-yourself (DIY) projects as well as opportunities to exercise my frugality in the hobby. So, I thought creating this nano all-in-one would be a fun, affordable project with a small risk and large reward if it was successful," Butch explained. He soon realized that by starting out with such a small tank he would be going against the grain of what most seasoned



■ Red cherry shrimp (*Neocaridina heteropoda* var. "red").

reef experts believe, since larger tanks are more forgiving when the parameters are slightly off. However, Butch's success with this small tank has come from several years of experience dealing with high-light planted tanks using Estimote Index (EI) dosing with CO<sub>2</sub> setups and a strict maintenance regimen.

### EQUIPMENT

The tank itself is actually divided into two sections, a 4.4-gallon display tank and a 1.1-gallon refugium. The equipment for the tank is located in the refugium. It has a 50-watt preset submersible heater. There is a 110-gallon-per-hour pump and a 50/50 screw-in compact fluorescent bulb on the

tank, which he plans to upgrade with a par 38 LED bulb.

Although not technically pieces of equipment, the tank contains 8 pounds of live sand, which equates to a sand bed depth of 1½ inches, and 9 pounds of live rock from Fiji and Tonga, which comprises his filtration system. In addition, he has a do-it-yourself media rack that has activated carbon, filter floss, an ion-filter medium, and a porous, synthetic polymer meant to remove organic materials.

### LIVESTOCK

"Once it was put together, I began planning the inhabitants, which I knew would need to be picked relative to the size of the tank, so I chose the watchman goby and a pistol shrimp as well as a small clean-up crew," Butch explained. "I'm still trying to acquire the shrimp, but the goal of this pairing was to witness the symbiotic relationship that exists between the two."

The cleanup crew consists of a blue-legged hermit crab (*Clibanarius tricolor*). Butch also has a variety of low-light corals in the tank, including "whammin' watermelon" and blue-green zoanthids, green ricordea (*Ricordea florida*), and a pulsing xenia.

### MAINTENANCE

Butch's tank also runs with no ammonia, nitrite, or nitrate. He maintains a pH



■ Butch's nano reef is also effective at demonstrating what can be accomplished in confined settings.

of 8.3, a specific gravity of 1.025, and a temperature of 78°F.

While a little more complicated than J.B.'s routine, Butch still has it fairly easy. He conducts a one-gallon weekly water change and tops off the tank twice a week

with one cup of pure reverse-osmosis water. He also regularly changes out the filter floss.

### Advice to Remember

Although they did their tanks in



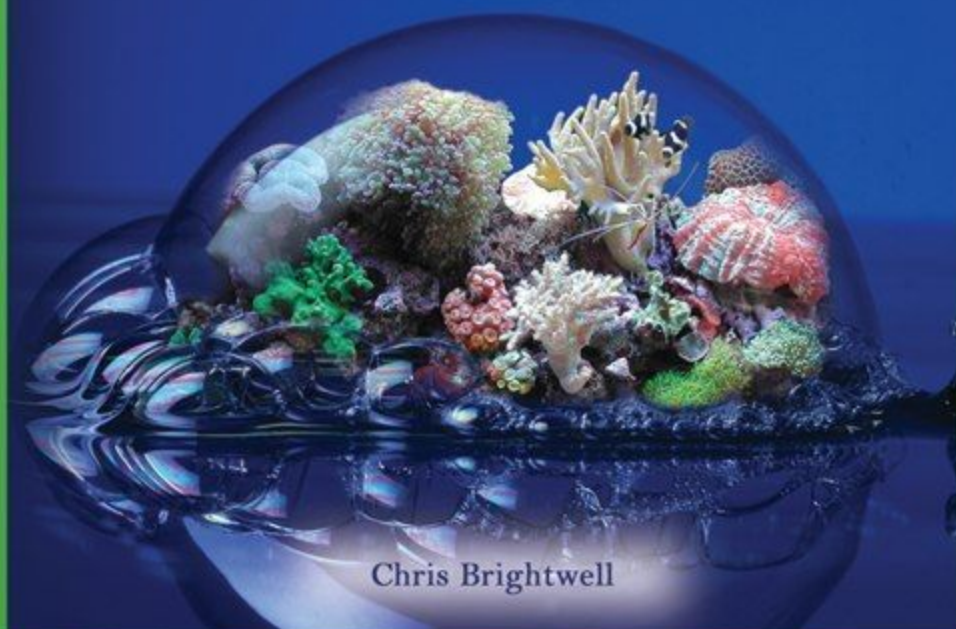
■ Yellow watchman goby (*Cryptocentrus cinctus*).

different styles, J.B. and Butch both share similar advice for anyone who wants to try a nano tank. "I always encourage the members at the *TFH* Forum to take things slowly and keep water parameters stable, versus trying to match the parameters in the species' original habitat. I'd also remind potential nano aquarists to stay on top of their maintenance routine and plan their fauna choices accordingly," J.B. said. 🐠

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# adventures in aquascaping

## A 125-Gallon Airplane Hangar Aquarium, Part 2

In the March 2012 issue, I began describing an installation that I did in a rather unique location: an airplane hangar. I went into the equipment that my client purchased before I became involved and why we decided to change the majority of it. When picking out items for any tank, it is important to ensure that they can handle the size of the job you want them to do. Last month, I looked specifically at upgrading and improving upon the filtration system. Now it is time to look at the remaining equipment choices.

### Lighting

As I mentioned last month, my client originally purchased a few T5 bulbs that wouldn't be strong enough for the coral garden he envisioned. We decided to go with LED lighting because this client was looking for something out of the ordinary. Though the initial price of the LEDs was high, it wouldn't take long for them to pay for themselves due to low electricity consumption and the fact that there were no bulbs to replace on a regular basis. Without going into a long, technical discussion about the pros and cons of the different types of lighting for reef aquariums, my experience with LED lighting has shown me that soft corals and large-polyp stony (LPS) corals do quite well under them.

### Pumps

The two submersible pumps he had purchased were replaced with a high-quality, Japanese-made external pump. I oversized this pump because I would be building a manifold underneath the tank out of PVC with which to feed water to the different pieces of equipment and the tank itself. In case this pump was still too powerful, or if some of the equipment it

was meant to feed was removed, I plumbed a loop from the intake of the pump to the return side of the pump. Ball valves would control how much, if any, water could be fed back into the pump itself. In effect, if the water flow to the system was too great, the ball valve after the return side could be closed slightly and the ball valve on the intake could be opened slightly to allow the pump to consume some of its own output.

### Sump

The flimsy and thin acrylic sump/refugium combo he had was replaced by a 58-gallon glass aquarium. I could have had this custom made using acrylic, but the cost for that would actually be more than just using a standard glass aquarium off the shelf.

Using a diamond-encrusted hole bit, electric drill, and a purpose-built suction cup well that holds a 50/50 mix of antifreeze and water around the area to be drilled, I cut a 1¾-inch hole near the bottom of the left side of the 58-gallon glass sump. This hole was for the 1-inch bulkhead that would be used to feed water to the intake of the main pump. Just a quick note: Remember that you cannot drill the bottom of many glass aquariums. Most glass aquarium manufacturers make the bottom piece from tempered glass for strength, and it will shatter if drilled.

### Dosing Computer

One thing that my client didn't necessarily think about originally was that corals need calcium, carbonates, and magnesium (among other elements) in order to build their skeletons. You can either dose these elements by hand or get a dosing computer to do this for you automatically. Can you guess what this

Ben Johnson has been a professional aquarist since 1995 and is the owner of Captive Aquatic Ecosystems ([www.caecosystems.com](http://www.caecosystems.com)), a custom aquarium sales and maintenance company in the Houston, Texas area. From 2002 to 2004, Ben worked as a zookeeper at the Houston Zoo and Kipp Aquarium where he was the sole keeper in charge of the 4000-gallon Reef Zones exhibit.



ben johnson  
photographs by the author

engineer would ask for? You got it! A dosing computer, which is controllable down to one milliliter of substance to be added, was mounted underneath the aquarium. Three 2½-liter cylindrical containers hold the three separate liquids that are dosed. The containers are attached to the dosing computer via tiny hoses, and a magnetically coupled dosing tube holder sits on the side wall of the glass sump. Every day, the doser draws the liquids from the storage containers and drips them into the glass sump. We test calcium, alkalinity, and magnesium levels in the aquarium during every visit and alter the amount of additives being administered if necessary.

## Automatic Top-Off System

An automatic top-off system was added to control the loss of evaporated water from the aquarium. Located inside the glass sump is a float switch. When the water level inside the glass sump drops due to evaporation, the float switch signals the automatic top-off unit (a peristaltic pump like those used in the medical industry) to draw water from a separate reservoir containing purified (RO/DI) water and pump it into the glass sump until the float returns to its off position. This keeps the salinity stable and also allows the protein skimmer installed inside the glass sump to work optimally due to a stable water level.

## Chiller

The final piece of equipment used was a chiller, which we placed above the aquarium on a strong wooden shelf my client designed and installed. We had originally placed the chiller below the aquarium with the rest of the equipment, but this caused too much heat buildup underneath the aquarium. The engineer had an air-conditioning duct mounted near the ceiling, and we installed the chiller up there as well. Given the way we designed the aquarium, water temperature wasn't an issue, but we installed the chiller just in case.

## Aquascaping

At the bottom of the aquarium, I placed about 2 inches of fine aragonite sand as a substrate. I next placed four 6-inch PVC couplings across the back, with thick plastic grating on top running across the span of couplings like a bridge. I used this structure to support the aquascaping so as



■ A dosing computer, automatic top-off system, and other high-quality components were incorporated to keep the aquarium's rich livestock thriving.



■ The setup's mahogany furnishing is equally impressive and instills the tank with a pleasant, vintage feel.

little rock lies on the sand as possible. This helps cut down on the amount of detritus buildup in the aquarium. I placed live rock rubble inside the 6-inch couplings so small creatures, such as hermit crabs and the like, can crawl back out of the coupling if they happen to fall into one. Then I stacked the live rock into a loose and open structure to help water flow in and around the rock.

## Livestock

After filling the aquarium with salt water (with a specific gravity of 1.025) and turning the filtration on, I got a flashlight and checked for leaky plumbing. Once that checked out, I examined the functioning of all the filtration components, adjusting anything that needed adjusting. A small

amount of ammonium chloride and some beneficial bacteria were added in order to jump-start the nitrogen cycle. The ammonium chloride provides the bacteria with something to consume and begin their population growth.

Two weeks later, a few small fish were added, and I instructed my client to feed a small amount of food once daily. Two weeks after that, we added a few more fish and some easy-to-keep soft corals. Every other week, while there to perform regular maintenance, I added a few fish and a few corals, slowly building the livestock levels up.

## Near Disaster

My client had begun to stain and seal the mahogany-paneled walls he installed over the metal inside the building. Seeing that he was spraying stain and sealant, I told him he needed to cover the tank in plastic and seal the door shut. Unfortunately, these precautions were not taken.

He called the next day to tell me that the skimmer was not working well. We spent an hour on the phone brainstorming on what it could be. When I asked him if he covered the aquarium, I was met with silence followed by expletives.

Visiting the aquarium the next day, I was relieved to find that none of the livestock was affected. The powerful skimmer had actually sucked in solvent from the air, collapsing the foam production inside the skimmer because the solvents prevented bubbles from forming. I threw in some activated carbon and performed a large water change just to be sure. The skimmer neck and cup had small scratch marks all over them from the solvent reacting with the acrylic. This is known as crazing.

We really dodged a bullet on this incident, but now the client fully understood the sensitivity of a reef aquarium. Protein skimmers have come a long way, and the amount of air they can draw in is incredible. Anything in the air, such as cigarette smoke, paint, bug spray, and cleaning spray, can be sucked into the skimmer and mixed with the aquarium water. It's wise

to be cautious of things sprayed in the house that could be detrimental to your reef aquarium.

### Further Additions

Thus far, we have not put very many fish into this aquarium. The first ones in were a clownfish from the client's original 30-gallon aquarium and a large adult

blue velvet damselfish (*Neoglyphidodon oxyodon*). My client had purchased the blue velvet damsel himself, and I was a little disappointed when I first saw it in the tank. This damsel becomes large and usually very territorial and aggressive. Upon informing my client of what I thought was a bad selection, he told me a story about how his wife and he had owned one years before that lived to be 10 years old. The fish had survived all that time despite all his best efforts to kill it through occasional mishaps. The damsel had historical significance and was there to stay whether I liked it or not.

Several *Aiptasia* nuisance anemones popped up during the first month of the aquarium's existence. If ignored, they would take over the aquarium. To combat this I added a Klein's butterflyfish (*Chaetodon kleinii*) and 15 peppermint shrimp (*Lysmata wurdemanni*). Unfortunately, the Klein's did not make it past a couple days, but the shrimp took less than one week to decimate about 30 *Aiptasia* anemones.

A week after the butterflyfish and shrimp were added, a foxface rabbitfish (*Siganus vulpinus*), fifteen *Nassarius* snails, five *Astraea* snails, a coral banded shrimp (*Stenopus hispidus*), ten emerald crabs (*Mithraculus sculptus*), and an arrow crab (*Stenorhynchus seticornis*) were all introduced into the system. After another week, a flame hawkfish (*Neocirrhites armatus*) was introduced along with a few corals. Within the next two months, the client and I hope to add five more fish of various sizes and colors.

### A Happy Client

This aquarium is about three months old now, and the client is very pleased with the aquarium's progress. We continue to slowly add livestock to it on every visit and monitor the growth and health of the previously added livestock. This reef has begun to settle in, and everything is functioning and growing quite well.

Working for an engineer has been an eye-opener for me as well. He got me to think out of the box on this build. This aquarium is much more equipment intensive than my 125-gallon reef at home, but this is a maintenance account and not a hobbyist's aquarium. Though clients such as my engineer friend can be difficult to work with at first, he is the type of customer who keeps me on my toes—and for that, I am grateful. 🐠



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# the salt mix

## The Semicircle Angelfish

There are quite a few angelfishes commonly available in the trade, some big and some small. Of the larger species, which typically require large tanks to stay happy and healthy, there's one that I've always had a particular fondness for: the semicircle angelfish. This species was one of my favorites out of all the big fishes that I ever kept in customers' tanks when I had a maintenance business. Also known as the Koran or half-circle angel, this fish gets high marks from many other folks.

This fish's scientific name is *Pomacanthus semicirculatus*, and it's a member of the family Pomacanthidae. This family is home to eight genera and about 85 species of angelfishes, with some of the semicircle angel's close cousins being the popular Asfur angel (*P. asfur*), blue-ring angel (*P. annularis*), emperor angel (*P. imperator*), navarchus angel (*P. navarchus*), French angel (*P. paru*), and gray angel (*P. arcuatus*). It can be found in the Red Sea and the Indo-Pacific region from East Africa all the way over to Samoa. North to south, it also ranges from the southern islands of Japan down to western Australia and New South Wales.

As far as appearances go, there's obviously a big difference in the juveniles and adults. Adults tend to be brownish at their back end and greenish to yellowish elsewhere, with brown, blue, and greenish/yellowish spots and details scattered about. Conversely, the small juveniles have a primarily black body covered with blue and white stripes. Some of these are semicircular in form, which is where the fish's semicircle and half-circle names

come from. Subadults are something in between the two extremes, of course, with the slow transformation from juvenile to adult coloration typically occurring when an individual is in the 4- to 6-inch range.

During this stage of life, they usually have some pretty blue markings that resemble Arabic writing on their tails. This is the source of the Koran name. They actually all used to be called Koran angels by some, but others called the adults Korans and the juveniles semicircles. Now it seems like lots of folks are calling them semicircles regardless of size, so that's what I stuck with. Don't be surprised if any given specimen is still being called a Koran angel at a shop, though.

### Shopping Tips

If you decide to go shopping for one of these beautiful fish, be sure to give a specimen a good looking over (as you should with any other species) before you buy. Watch out for any obvious bodily injuries, frayed fins, ich or velvet, head and lateral line erosion, abnormal (rapid) breathing, pinched-in stomachs and skinny bodies, etc. You should also always make sure that a fish is eating whatever you intend to feed it at home. If a semicircle angel won't take a meal of appropriate foods and/or acts overly skittish and tries to hide at all times, keep shopping. These tend to be rather bold fish and shouldn't shy away.

Other than that, small juveniles (less than 2 or 3 inches) may look very nice, but they are also generally less hardy than larger individuals. Conversely, larger subadult to adult specimens (larger than

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

about 6 inches) are less likely to adapt to eating what you may want to provide and generally have a more difficult time adapting to life in the confines of an aquarium. So, it's best to look for something in the 3- to 6-inch range. Sure, there are exceptions, and many specimens outside of this relatively narrow size range may do just fine, but the further you stray out of this range, the lower the odds of success. Fortunately, it shouldn't be too difficult to find one of the right size if you're patient.

You should quarantine any fish you buy as well. It can be a hassle, but doing so dramatically reduces the odds of bringing something nasty into your aquarium. I'll get to why in a moment, but one of these fish should likely be the last to go into an aquarium when stocking. It would be terrible to have a tank full of healthy, acclimated fishes only to add a diseased fish at the end that ends up making everything else sick.

## Aquarium Settings

As I said, it's a relatively large fish for an aquarium when fully grown, reaching a maximum reported length of almost 16 inches according to FishBase. Of course, since that is the record size, very few of them will actually get that big, but it's common for them to reach a full size of over a foot in length. This, when considering its tall body form, still makes *P. semicirculatus* a big fish.

Taking this potential size into account, you're going to need a pretty big tank to house one. A small juvenile may be fine in something along the lines of a 30-gallon aquarium, but it'll soon need something bigger, and then bigger, and then bigger. Adult specimens will eventually need at least a 240-gallon tank to stay happy, so don't make the mistake of buying a juvenile specimen thinking it'll be fine in a typical 55- to 150-gallon aquarium for the long haul (unless you plan on finding it a new place to live in a few years).

Water quality should be excellent, as always, although it doesn't have to be as pristine as a well-run reef aquarium. And, there should be plenty of structure/hiding places in the aquarium regardless of the size of a specimen. It doesn't matter if you have fake corals, fake rock, or live rock; just make sure there are things in the aquarium of sufficient size and quantity to give one of these fish a



■ Juvenile semicircle angels (*Pomacanthus semicirculatus*) are easily identified by their neon blues and white circular striping.



■ As they approach the adult stage, juvenile semicircles begin to lose their spherical patterning and adopt an olive coloration.

good place to duck out of sight whenever it chooses to without trying to squeeze itself under or behind something.

By the way, just to make sure you really get it, these fish are not suitable for most reef aquariums. They get really big, as in way too big for most reef tanks. They'll also eat a variety of corals

and other invertebrates. I suppose it's possible to keep one in a very large reef aquarium that houses nothing but lots of small-polyped stony corals, but adding one to a tank that contains soft corals, fleshy stony corals, giant clams, and/or sponges will almost certainly lead to a loss of valued invertebrate livestock.



■ Aside from changes in coloration and patterning, adult semicircles feature a lengthy streamer on the dorsal fin.

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### Compatibility

When it comes to compatibility with other fishes, they'll get along with most other fishes, but not all. In the wild, they're typically found in mated pairs or alone, so I guess you might be able to keep a mated pair in a really big tank. But in all my years in the hobby, I've never seen a mated pair being sold together, so I doubt that'll be an option. Adding more than one small juvenile to a relatively large aquarium may work until they start to grow up, and if they are not a mated pair, you most certainly should not try to keep more than one subadult or adult in an aquarium unless it's an absolutely huge tank (as in thousands of gallons). They'll also likely fight with any other angel in the same genus. For that matter, they're not likely to get along with any large angels that aren't in the same genus either, especially if they're near the same size. But other than that, they're typically fine, and I didn't have any problems with them in correctly stocked aquariums.

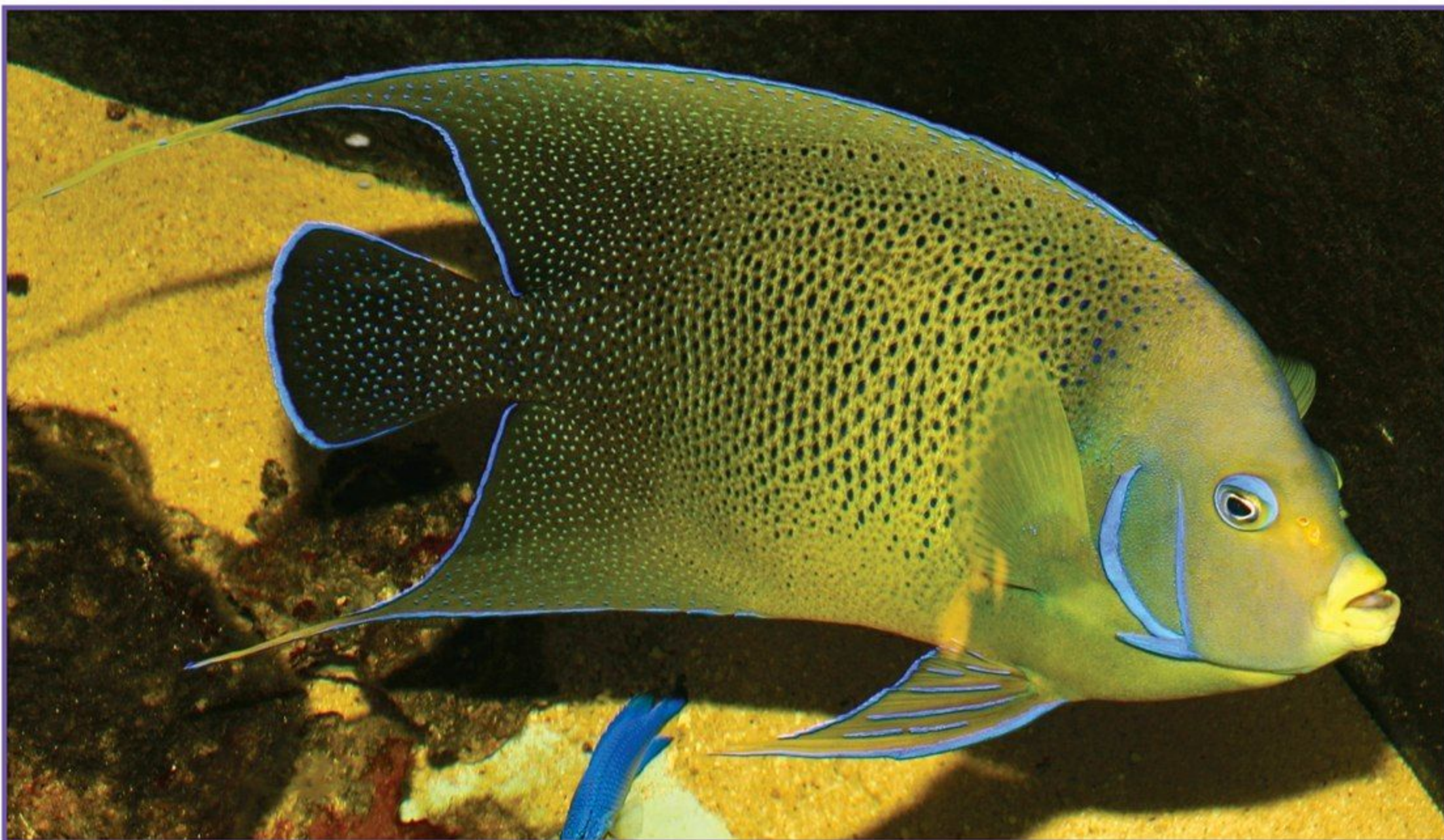
They do like to be the dominant fish in most aquariums, so it's a good idea to add one of these last. If you add one early on and it decides the aquarium belongs to it, it's more likely to be aggressive toward other

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■ *P. semicirculatus* requires plenty of structure in its tank for refuge.

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fishes that are added later. Wait to add one of these angels last unless you're planning to add something else that's even bigger and also likes to be the tank boss. That's what I meant by "correctly stocked."

## Aquarium Diet

In the wild, these angels are omnivorous, dining primarily on sponges, crustaceans,

tunicates, and algae. But as mentioned above, they'll also nibble on soft corals, large-polyped stony corals, and the fleshy mantles of tridacnid/giant clams. So, their diet is a diverse one, and this should be recreated in an aquarium for optimum health and coloration. For this reason, they should be fed a varied diet that includes meaty foods and greenery along with some sponge material.

Meaty meals can consist of chopped clam, squid, shrimp, and marine fish, and they should get some of this on a regular basis. Green meals can consist of servings of romaine lettuce, spinach, dried unseasoned seaweed (nori and kombu), or spirulina flakes. The spongy stuff can be provided by using specialty foods made for angels and other sponge eaters, which contain real sponge matter. This stuff is available in frozen



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■ Semicircles will eat various corals and meaty invertebrates, so avoid including these in their aquarium.

cubes, and I haven't seen a big angel yet that wouldn't gobble it up.

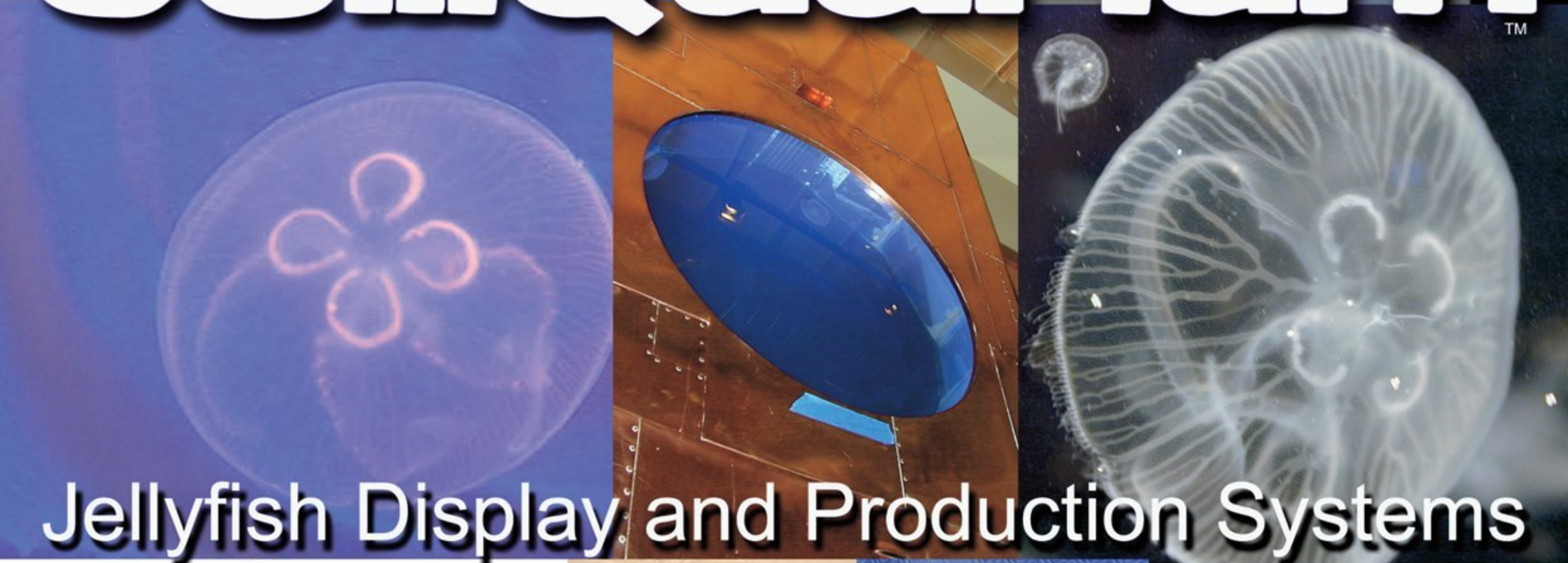
They are also grazing fish that browse around nibbling at this and that all day. Mixing up their diet and feeding them two or three times a day is much better than feeding them one thing once a day. Of course, for the short term, you can give them a good helping of flake food or brine shrimp if you're short on time for a day or two now and then, but this is not a good idea at all for the long term. Really, they should be fed green stuff at least once a day and the rest at least a few times a week.

## A Personable Pet

In summary, if you're a careful shopper, put a specimen through quarantine, keep it in an appropriately sized aquarium, and feed it well, the semicircle angelfish is about as hardy a fish as anything else you can buy. It's also a very personable fish that will look at you, watch what you're doing, and interact with you as much as a fish in a tank can. When you throw in its impressive looks, it should be clear that this species is a good choice for big-fish aquariums. It's also generally one of the more affordable large angels. 🐟



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■ You can enjoy the same layout with a fresh new impression by replacing the stem plants in the background while keeping the framework of the composition, the foreground, and the midground intact.

# Enjoying a Layout Longer by Replanting the Background

## Takashi Amano

translated by Tomoko Schum

**I**n the previous article, I discussed a way to enjoy a Nature Aquarium layout over a long period of time by replacing all the aquatic plants in the layout while keeping the framework of the composition intact. I am going to introduce another method in this article that allows you to accomplish the same thing by replacing only the plants that have become difficult to maintain in the layout.

### Characteristics of Stem Plants

Various combinations of aquatic plants are used in aquatic plant layouts, including Nature Aquarium layouts. Aquatic plants grow differently and at different speeds depending on their types. The type of aquatic plants that grow vertically at a fast speed, such as stem plants, need to be maintained through repeated trimming. Stem plants generally develop multiple new side shoots when their terminal

buds are cut off. Their stems and leaves will become denser as this process is repeated. While the newly developed stems at the top are young and fresh, the original stems at the substrate grow older and decline gradually.

Although this depends on the type of stem plant, older plants need to be rejuvenated after a while by cutting off the older part of the stems and replanting the top part. The younger top part is replanted, since aged stems do not develop new shoots well. This



type of replanting is essential for the long-term maintenance of a layout with stem plants in the background.

In contrast to stem plants, undergrowth plants in the foreground, such as *Glossostigma* and *Echinodorus tenellus*, spread sideways by developing runners. Therefore, they can be maintained over a long period of time by trimming the top layer of the plants or by cutting off runners and thinning the plants when

the runners and leaves form a mat. Additionally, sciophytic (shade-loving) plants in the midground, such as ferns and *Anubias*, do not require trimming like heliophytic (light-loving) plants, such as stem plants, do because they grow relatively slowly. Thus, in order to enjoy a typical aquatic plant layout over a long period of time, periodically rejuvenating existing stem plants by replanting their top part or replacing all the stem plants

in the background will become a primary task. Compared to the background, the foreground and the midground are much easier to maintain.

### Maintaining Stem Plants

In order to rejuvenate the existing stem plants in the background, the stem plants need to be pulled out of the substrate temporarily. Since stem plants also take root in the substrate, detritus in the



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■ The same layout before *Sozo Haishoku*. The makeup of the aquatic plants in the background is different.



■ The appearance of the layout shortly after removing the stem plants and placing semispherical plant media in the background.



■ Looking from the back side of the aquarium, you can see the nine pieces of semispherical media made of plant materials placed over the smoothed-out substrate.

substrate will be stirred up and cloud the water as the stem plants are pulled up in the water. If such dirty water enters a fish's gills, it can cause the fish to get sick. Therefore, fish should be moved temporarily to another tank or container with the clean tank water before pulling up stem plants. Additionally, draining as much water from the tank as possible beforehand makes it easy to pull up the stem plants.

Once the stem plants have been removed, the substrate will be disturbed, with a part of the nutritive soil substrate dug up and some of the nutritionally enhanced sand exposed. New soil should be added on top of the substrate, and the surface should be smoothed out. If you are going to replant the existing stem plants, they should be cut to a uniform length and the upper young stems should be planted.



■ The layout two months after placing semispherical plant media. Looking from the back of the aquarium, you can see that the stem plants are growing very densely from the bases of the media.

## DATA

**Aquarium:** Cube Garden W90 x D45 x H60 cm

**Lighting:** Solar I (NAG-150W-Green) x 3 units over two 90 cm H tanks, turned on for 10 hours per day

**Filter:** Super Jet Filter ES-1200 (Bio Rio M, NA Carbon)

**Substrate:** Aqua Soil Amazonia, Power Sand Special L, Bacter 100, Clear Super, Penac W/for Aquarium, Penac P, Tourmaline BC

**CO<sub>2</sub>:** Pollen Glass Large 30, 3 bubbles per second via CO<sub>2</sub> Beetle Counter (using Tower)

**Aeration:** For 14 hours after the light is turned off using Lily Pipe P-4

**Water Change:** 1/3 once a week

**Water Quality:** Temperature 25°C (77°F), pH 7.0, TH 20 mg/l

**Aquatic Plants:** *Micranthemum umbrosum*, *Rotala rotundifolia*, *Polygonum* sp., *Ludwigia arcuata*, *Limnophila sessiliflora*, *Glossostigma elatinoides*, *Echinodorus tenellus*, *Microsorium* sp. "narrow leaf," *Fontinalis antipyretica*

**Fish/Invertebrates:** *Hemigrammus rodwayi*, *Hyphessobrycon rosaceus*, *Hyphessobrycon* sp., *Otocinclus* sp., *Crossocheilus oblongus*, *Caridina japonica*

[Note: The hardware itemized above represents the author's specific choices; equivalent results may be obtained with other equipment and accessories—Eds.]

## Changing a Layout

The same general procedure also applies when replacing the plants with new stem plants. The appearance of the layout will not change when the existing plants are replanted. On the other hand, if the layout is replanted with new and different aquatic plants, the appearance of the layout will change dramatically and you can enjoy the same layout with a fresh, new impression. It is important to revamp the impression of a layout when maintaining a layout for a long period of time. I call this type of replanting *Sozo Haishoku* (creative plant rearrangement).

The layout in this article was replanted using this method. A collection of various stem plants that are planted in a semispherical media made of plant materials was used in this remake instead of planting aquatic plants with tweezers. Since the aquatic plants have been grown and already taken root in the media, planting is finished by simply placing the sphere on top of the substrate. These stem plants are grown much more densely than those planted one at a time into the substrate with tweezers. Because they have sturdy emerged-grown leaves, they develop healthy submersed-grown leaves rapidly under water.

A variety of stem plants are used to produce the sphere. The majority of the stem plants that are used in this layout are large pearl grass, *Rotala indica*, and *Polygonum* sp. They also include a small number of needle leaf *Ludwigia* and *Ambulia*. As in the case of stem plants planted in the substrate, the plants on the sphere are also maintained through repeated trimming. Since these stem plants are quite tolerant of trimming, they do not have to be replanted as often. Replanting the top part of the sphere requires much less work, since you can simply cut off the roots and remove the stem plants by the base. 🐾

Photographs by the author.

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MARK DENARO  
RECREATING  
THE **AMAZON:**  
TWO CATFISH BIOTOPE AQUARIUMS

**T**he catfishes are among the most popular fishes from the Amazon Basin. Members of this diverse group of fish range from species that reach only an inch in length to those that exceed 4 feet, with behaviors that range from inoffensive to voracious. At least one species of catfish can be found in almost any biotope in the Amazon system, so a little knowledge about the species you wish to maintain is essential to accurately replicate its environment. I'll concentrate on the two most commonly kept catfish families: Callichthyidae and the Loricariidae, which will provide the opportunity to set up two very different-looking aquariums.

While a trip to the Amazon may not be in everyone's budget, similar habitats can be found in many North American streams, so it should be possible for everyone to view

these two habitats in nature. In fact, I'll use a section of a small stream near my house in southeastern Pennsylvania as a loose guide for both habitats.

### All About Cats

The most popular callichthyids are the members of the subfamily Corydoradinae. The genus *Corydoras* currently contains over 150 described species along with a number of undescribed forms. It is probable that this genus will be divided in the near future and the various subgenera will be raised to genus status. Other genera in this subfamily include *Aspidoras*, *Brochis*, and *Scleromystax*.

These fish have evolved to live on relatively soft substrates, mud or sand, and feed upon worms and other animals that live in the substrate. Most are schooling fish

and tend to inhabit shallow, relatively slow-flowing stretches of streams. Some of these species attach their eggs to the substrate, some spawn on rocks or driftwood, while others spawn on or among plants. Some lay individual eggs or small clutches of eggs in one spot and then repeat the process in another until the spawning act is complete. Others lay all their eggs in one place. Biotope tanks that are set up properly should provide appropriate places for the fish to spawn, as that is a part of the natural behavior we hope to observe.

Many of the loricariids are adapted to fast-flowing water and rocky habitats. The sucker mouths of the various plecos serve two purposes: rasping algae and detritus from rocks and hard substrates (and in some cases, eating wood) and hanging on to rocks to maintain their place in fast-

current streams. There are two primary breeding methodologies among these species. They either lay adhesive eggs in the interstices of the rocks or in holes they dig under the rocks, which are then guarded by the male, or they dig caves into the banks during the high water season and spawn there, again with the male guarding the nest. The species that dig into the banks tend to be rather large, and that habitat is difficult to recreate in the aquarium. Of the many rock-spawning genera, the ones most suited for the average home aquarium are the various *Hypancistrus*, *Ancistrus*, and *Peckoltia* species. Members of these three genera are typically 3 to 7 inches in length, so they can be maintained in average-sized tanks and will be the focus here.

## Crazy Cory Biotope

A mud habitat for a cory tank may not be something you want to replicate, but a fine-sand substrate will work quite well. I prefer using dark sand, but in this case, light-colored sand can also be a viable option. In most cases, the fish's patterns will be more vibrant over a darker bottom, but with cories, it really doesn't seem to make that big a difference. Many serious cory breeders prefer to use light sand in their tanks. Sands marketed for aquariums are always a safe choice, but most play sands and landscaping sands can also work well if you can conduct research or test it to make sure it is safe for aquarium use. The biggest drawback to fine sand is that it can become anaerobic, so it's important not to make it too deep. I would suggest 2 inches as the maximum depth, with an inch or less really being all that is necessary. The cories will dig in the substrate and keep it from becoming anaerobic as long as it isn't too deep.

For most Corydoradinae species, a 10-gallon aquarium is sufficient for a school of eight to fifteen. A few of the larger species, such as *C. robustus*, will need significantly more space, while larger numbers of the smaller species, like *C. pygmaeus*, can be housed in a 10-gallon tank, so it's still a good basic size to work with. Just be sure to research whatever species you choose to make sure it won't outgrow the tank.

## MAKING THE AQUASCAPE

Because a flat sand bottom isn't too interesting to look at, we're going to cheat a bit and add a few focal points.



■ A fine-sand substrate is useful for replicating the natural habitat of cory species.



■ The loricariid habitat is marked by fast-flowing waters and rocky substrates, similar to those found in this Pennsylvania stream.

By researching where the species you're planning to keep places its eggs, one can make an informed decision regarding the appropriate materials to use as focal points. I like to add a piece of driftwood to tanks for cories so they'll have a place to hide and get out of the light if they'd like to.

I'll also add some plants, as these species will inhabit the flooded forest during the rainy season. In order to stay geographically appropriate, I use species such as black Amazon swords (*Echinodorus peruensis*), which sport the same growth form as the typical Amazon sword (*E. bleheri*) but stay much smaller. *E. peruensis* will seldom exceed

10 inches in height and can produce up to 60 or so leaves, making it a very effective focal point in smaller tanks. If you'd like to add some additional color with your plants, any of the smaller *Echinodorus* cultivars, some of which have red and/or gold in their leaves, would be acceptable. As an alternative to the *Echinodorus*, one of the water lilies (*Nymphaea* spp.) could be used in this position, as it would be natural for cories to shelter in the shade cast by floating lily leaves at certain times of the year and in certain habitats. The problem is that most lilies get too large for use in aquariums. Fortunately, some of their relatives have smaller growth forms



■ Placing rocks on different levels will improve visuals and create areas for refuge.



■ False zebra pleco (*Hypancistrus debilittera*).

and can be used quite effectively. Examples include banana plants (*Nymphoides aquatica*) or one of the water snowflakes of the genus *Nymphoides*. *Nymphoides* are more commonly grown as pond plants, but they do quite well in aquariums and give us the growth form of a water lily with much smaller pads, making them appropriate for use in relatively small aquaria. If they are given good lighting and fed regularly with tablet fertilizers placed next to or below the roots, they will flower readily in the aquarium, giving an added bonus.

A group planting along the rear of the aquascape can be effectively established with one of the *Sagittaria* species. The best choice will be determined by the height that we want the plants to grow. For a 10-gallon tank, *S. platyphylla* will work well when planted along the back of the biotope. This will provide an attractive backdrop for viewing the fish, and since they'll grow only to 8 to 10 inches in height, they won't outgrow the tank. Excellent choices for minimal planting in the foreground are dwarf sagittaria (*S. pusilla*) and pygmy chain sword (*E. tenellus*). Brazilian

pennywort (*Hydrocotyle leucocephala*) can also be used as a foreground plant, or it can be attached to the driftwood in the same manner as *Anubias* or Java fern.

### ADDING A BREEDING TANK

It should be noted that while successful breeding will occur quite frequently in a biotope setup, many serious cory breeders set up tanks that are similar to the one described above but do not concern themselves with accurately representing the flora found in the natural habitat of the species in question. Instead, they tend to use lower light levels and add plants more suited to these conditions, such as *Anubias*, Java fern, and Java moss. They also tend to use lighter-colored sand.

### COMPLETING THE SETUP

The pictured biotope houses eight *C. leucomelas*, a readily available species from Colombia. While a fair amount of bottom space is left open for the cories, there is a group planting of *S. platyphylla* in the left

rear that reflects the planting of *S. pusilla* in the right foreground. Some *H. leucocephala* is entwined in the pile of driftwood, and there is a single specimen of *N. indica* to provide some floating pads and shade the open area somewhat. The cories are quite active and always working the open areas of sand or hanging out in the driftwood.

### A Pleco Biotope

Bottom space is more important than height for the pleco types, so I'm going to use a 15-gallon tank (24 x 12 x 12 inches) for the loricariid biotope. The high water flow in the biotope required in this aquascape does not lend itself well to the addition of plants, so they will not be included here. Rocks will be the most important feature, so I'll need to build a rock sculpture that is interesting to look at and also encourages the fish to be in areas where I can see them.

I have a group of false zebra plecos (*Hypancistrus debilittera*), more commonly known as L129, so I'm going to build this aquascape for them. While most of the rocks in the natural habitat are partially buried in the substrate, some sit upon other rocks, and I'm going to emphasize that aspect. The idea here is to build up a level or two of rocks so there is space beneath the rocks where the fish can hang out and where I'll be able to watch them. To add vertical interest, rocks can be built up along the back wall as well.

If your intention is to spawn your fish, be sure to create some appropriately sized caves within your rock structure. These fish like to spawn in caves that are just large enough to hold a single fish. If you are creative, you can also work some of the commercially available ceramic pleco caves into the base of the rock structure. In order to maintain the integrity of the biotope, it is important to keep any commercial caves in the base and to build up a rock structure that keeps them out of view. While a few hours of bright light will be beneficial to algae growth on which *Ancistrus* will feed, *Peckoltia* and particularly *Hypancistrus* don't really need a lot of light. In fact, the fish are more likely to spend some time in front or on top of the rockwork in dimmer lighting. Ambient room lighting is probably sufficient for these species if you want to cut costs by not purchasing a light fixture. Alternatively, a small fixture with built-in moon lights can work well. These species are primarily nocturnal, so using the moon lighting will help the aquarist see the fish when they are at their most active. 🐟

Photographs by the author.

Jack  
Wattley

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■ Imperial tetra (*Hyphessobrycon nigricinctus*).



# Breeding the Imperial Tetra

Mike Hellweg

**T**he heyday of tetras in the hobby was the 20-year period from the late 1940s through the late 1960s. Several books about tetras were published, and the fish were in high demand. New species were being imported on a weekly basis, and you could only find new species in the local fish store if you got there on the day the fish arrived, otherwise you risked missing out on having the latest and greatest. To stay ahead of this demand, several tropical fish importers even bought retired WWII aircraft from the US government and repurposed them into tropical fish transports that flew back and forth from South America, bringing new and interesting fish with each trip.

Aquarium magazines of the time, including *TFH*, regularly published breeding articles as hobbyists shared their successes. For tetra fans, these giddy times seemed to slow down in the next several decades, but in the past few years, this has been changing. Several stunning new tetras have been described by scientists, and many are also making their way around the aquarium hobby, with hobbyists creating demand by sharing pictures and trading them over the Internet even before they become established in the commercial trade. One of these beauties is *Hyphessobrycon nigricinctus*, which seems to have garnered the impressive-sounding common name of imperial tetra.

The imperial tetra (sometimes also labeled as the Morado tetra) was first found about 10 years ago in the Madre de Dios River in southern Peru. The wild habitat is marked by less rainfall and a lower high-water season than many other areas of the Amazon drainage, so the fish don't experience as much seasonality in their habitat as some of their cousins in the other parts of the Amazon Basin do. This may have relevance in their captive breeding, as it appears they are not seasonal spawners in captivity.

The fishery east of Cuzco began to open to the aquarium hobby in 2002, and experts estimate there may be many more species in this area that are yet to be described.

The imperial tetra was one of the first new fish from this area to enter the hobby. In 2004, it was also one of the first of these new fish to be described by science. It was given the name *H. nigrinotus* by Zarske and Géry. Around this time, it was also being imported in decent numbers and some hobbyists were starting to keep them. But the first spawning reports didn't start appearing until about four years later.

Even today, they aren't commonly kept, and only a few people have reported any luck with getting them to spawn. Hopefully that will change as more people begin to work with them and commercial breeders start to produce them in quantities. While I've found them to be undemanding and relatively easy to spawn once sexually mature, others have had very different experiences. If you have not yet tried spawning any tetras, I recommend trying a few of the easier species first to build up your confidence; otherwise, these guys might make you reconsider breeding tetras!

## Captive Requirements

Aquarium care is straightforward as it is for most *Hyphessobrycon* species. Give



■ A relatively new discovery, the imperial tetra has already charmed many aquarists with its bright colors and fascinating behavior.

with beech, almond, and others. These slowly decay and add tannins and other beneficial substances to the water. They also add a slightly yellow or brownish tint to the water over time. Many breeders and keepers think this looks more natural and makes the colors of the fish pop, but some people do not like it and think all aquarium water should be crystal clear, even if it does

so aim for a group of at least eight to twelve fish. They are peaceful fish and do well with other peaceful species, so keep them with cories, small Loricariids, other *Hyphessobrycon* or *Hemigrammus* species, pencilfish, hatchetfish, small barbs and rasboras, and even killies.

Feeding is not a problem. Even wild-caught fish will take high-quality flakes and pellets. Add live and frozen meaty foods several times a week. They will take frozen mysis, brine shrimp, bloodworms, daphnia, and similar foods. They will also take live baby brine shrimp (even the adults will eat this), Grindal worms, whiteworms, blackworms, daphnia, young cherry shrimp, young *Gammarus* shrimp, and similar foods. They do not seem to be as interested in things that stay near the surface, such as fruit flies and flour beetles. When conditioning for spawning, enhance their diet by adding chopped earthworms and minced shrimp from the grocery store for a week or so prior to setting them up.

Both males and females seem to reach a similar adult size of just over 1¼ inches or so standard length. Females are a bit stockier and a bit higher bodied. In addition, males have red edges on all of their unpaired fins, while those of females are colorless. They remind some visitors of my fishroom of black neon tetras (*Hyphessobrycon herbertaxelrodi*), but a closer look will reveal that they are not the same fish. The red-edged fins, red eye, red adipose fin, and wide, even, velvety black band extending into the center of the caudal fin—edged with a thin greenish-silver band above on a silver body—are dead giveaways. I've seen some photos online showing males with



■ Driftwood and dried hardwood leaves can be added to enhance the water quality for *H. nigrinotus*.

them at least a 15- or 20-gallon tank, good filtration maintained according to the manufacturer's instructions, some room to swim, and some plants around the edges to feel secure. They seem to be most happy with water temperatures in the middle to upper 70s. Large, regular water changes are in order.

It is a good idea to add driftwood and/or dried hardwood leaves to the tank. I use oak leaves, but others find similar success

not benefit the fish. To clear the water, run a filter with activated carbon, which will remove the tannin stains in just a few hours. If you want something that more closely resembles the natural habitat, light-colored fine sand would be in order. But to bring out the richest color in the fish, use a dark substrate.

All *Hyphessobrycon* species are schooling fish, and the imperial tetra is no exception. They like to be in decent-sized groups,

bright red tails, but I have not seen that in any of my specimens.

## My Experiences with Imperial Tetras

### FIRST TRY

I first came across the imperial tetra about five years ago at one of the local shops I visited while on a speaking trip. Even though they were a bit expensive, I picked up three pairs. Unfortunately, two of the females did not survive the trip home because my luggage was lost by the airline and spent an extra day in transit. I acclimated the remaining fish with great care in a quarantine tank, and they settled in quickly and showed no sign of disease.

Over the next several months, they finished growing out. I set them up for a spawn for the first time in late summer, about six months after I acquired them. I treated them like most other *Hyphessobrycon* species, separating the female for a week, conditioning both her and the male on lots of meaty foods as described above, and putting them together one evening just



■ Like its congeners, the imperial tetra is a schooling fish that should be kept in groups.

months and, as I got ready to try again, something happened to the lone remaining female, which I found dead in the tank.

### SECOND ATTEMPT

It would be almost two years before I found more fish. By that time, Ted Judy and I were in the midst of the “TFH

with a group to see which would work better. The pair went into a 5-gallon tank, and the group went into a 10-gallon tank. Both were set up with a pile of mops on the bottom and a couple of hanging mops. The water was about 76° with a pH of 6.8 and a total hardness of about 60 ppm. Carbonates (alkalinity) were almost immeasurable. This seems to be a quirk of our local tap water this past year. Our water comes from the Missouri River, which has been at or near flood stage for most of the year due to massive snow melt up near the headwaters. All of this has produced water that has dogged the Malawi cichlid enthusiasts, as they have needed to add all kinds of products to harden and buffer the water, but for characin enthusiasts, this soft, low-carbonate water has been like liquid gold.

The pair spawned overnight and was removed first thing in the morning. The group dynamics in the other tank apparently meant either the males spent all of their time posturing and displaying for one another or the nonbreeding fish consumed the eggs as soon as they were laid. As it turned out, a few fry did show up in this group tank, but this was nothing like the results for the pair. This time, the eggs from the pair appeared to be nearly completely fertile. A few days later, I was rewarded with a cloud of fry darting around the pair tank. I was also surprised to find a dozen or so fry in the group tank.

### RAISING THE FRY

I started the fry on my soup mix: infusoria, green water, and microworms fed on a drip line into the tank. This supplies the fry with live food all day long and



■ Java moss is a great way to provide refuge for *H. nigricinctus* fry.

before lights out. I used a 5-gallon tank with a pile of bottom acrylic spawning mops and a couple of floating mops.

By the time I checked on them the next morning, they were done spawning, so I removed the adults. Unfortunately, all of the eggs had fungused by the following morning. While disappointed, I was not ready to give up. It could be that things were just a bit too warm, as it was August and the ambient temperature in the fishroom was around 80°F. I waited a few more

Breeder's Challenge,” and I put the group of a dozen juveniles in a 30-gallon breeder with an assorted group of various tetras for grow out and pretty much ignored them. I eventually worked my way through the other species in the tank, and the imperial tetras reached sexual maturity.

I separated the males and females and conditioned them on live blackworms, chopped earthworms, and minced shrimp. After about two weeks, I set up a couple of spawning tanks, one with a pair and one



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■ Imperial tetras will accept a whole range of foods, but chopped earthworms and minced shrimp are particularly effective for spawning.

gives them many different critters from which to choose when they are hunting, just like they would encounter in the wild. I've found the best growth with using this method, especially with new species when no one is really sure what the fry will eat. Just be sure there is enough room in the fry tank for all of the water. I find it's a good excuse to do a small daily water change with a piece of airline tubing.

By the third day of feeding the soup mix, I added some newly hatched brine shrimp nauplii. Within about 20 minutes, I could tell the young fish were eating the brine shrimp, so at the next feeding, I changed the soup mix to newly hatched brine shrimp and microworms. They received this food twice a day instead of via drip method. I continued doing water changes every other day for the next week and then switched to every third day. By the end of the third week, they were starting to look like miniature copies of the adults, and by seven weeks, many were nearly  $\frac{3}{4}$  inch long.

At this time, I moved the young fish into a 10-gallon tank with a wall-type sponge filter and switched them to once-weekly water changes like the adults. I also started mixing in finely ground high-quality flakes at feeding time. By the end of their third month, they were eating almost entirely flake food with just occasional feeds of meaty foods, just like the adults. They were now growing quickly, so I had to spread them out into a couple of 30-gallon grow-

out tanks to avoid stunting them. They were also now large enough that it was time for me to find homes for them. I found them to be in high demand among other characin aficionados.



■ Female *H. nigracinctus* are differentiated by colorless unpaired fins and a stockier body.

### A SPECIAL SURPRISE

While I was doing all of this hard work giving the fry all kinds of special care, the adults were merrily going about their business in their home tank, a 30-gallon breeder. I allowed Java moss to grow and fill about two thirds of the adults' tank. While doing a water change, I decided it was time to thin out this crop of Java moss. I was surprised to discover dozens of little

$\frac{3}{8}$ - to  $\frac{1}{2}$ -inch-long fry hiding among the Java moss!

I had done nothing special in this tank. I immediately tested the water: The temperature was 74°, pH was 6.8, the total hardness was about 60 ppm, and carbonates were barely measurable. I had not given the tank any special feeding for the fry, so they were subsisting on the microfauna living on and around the Java moss, which was also providing them with a hiding place from the adults. The young fish spent most of their time low in the water column, hiding under this mound of Java moss. Once I started adding newly hatched brine shrimp and microworms to this tank as well, I found more and more young fish coming out of the shadows. Once they reached about a  $\frac{1}{2}$  inch in size, they moved higher in the water column and joined the adult group.

I have not noticed any damaged fins, nor have I found any dead young fish, so I'm guessing they are all getting along pretty well. I should note that this tank has no other fish species other than a lone *Epiplatys* killifish that hatched and grew up in that tank, and I don't have any snails in this particular tank either. After all that

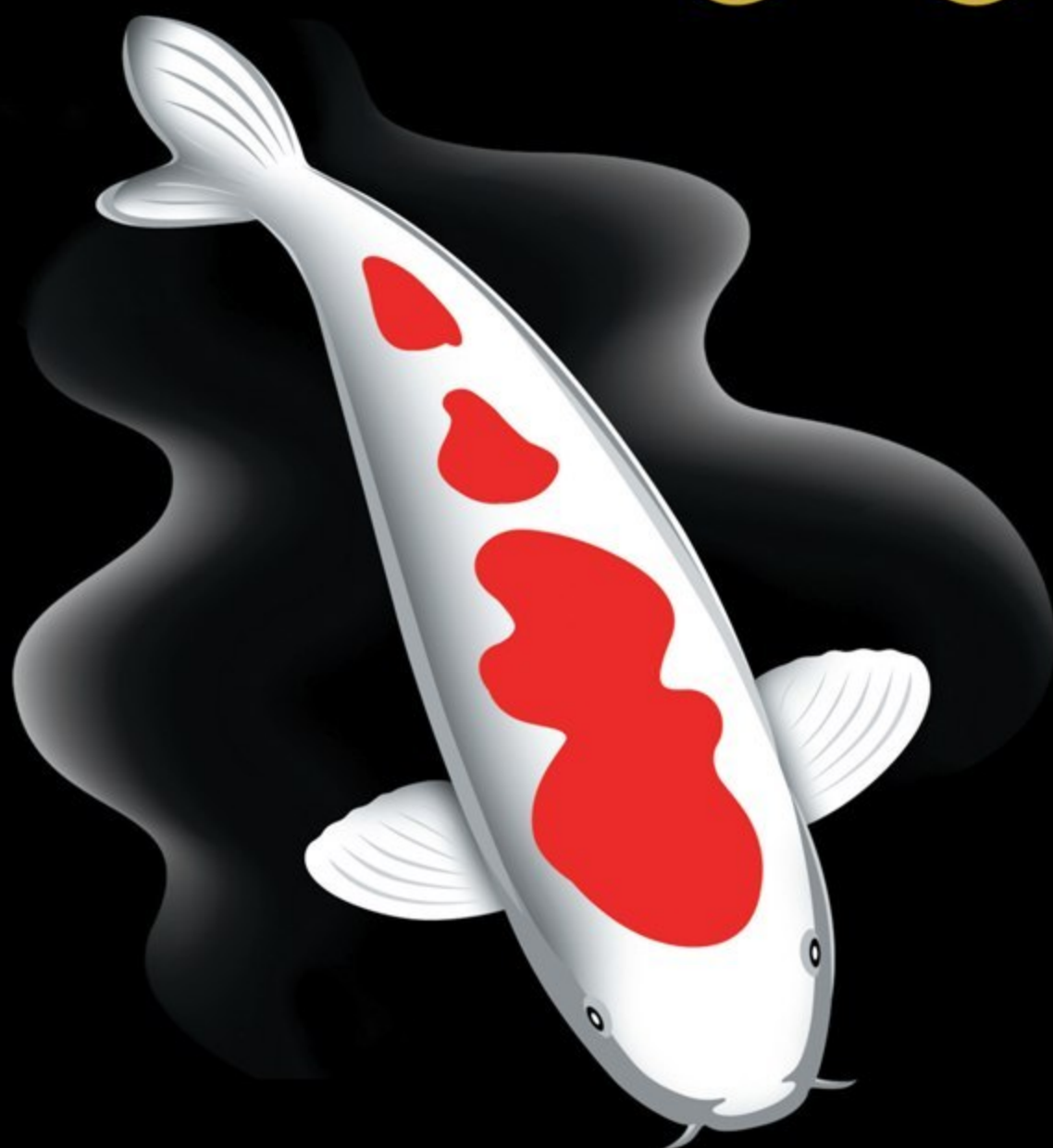
hard work, all I had to do was feed them and leave them alone!

If you come across any of the new tetras, don't hesitate to give them a try. Even if you don't have luck getting them to spawn, you still will enjoy their fascinating behavior and their elegant beauty, harkening back to a day in the hobby when tetras were all the rage. 🐟

Photographs by the author.



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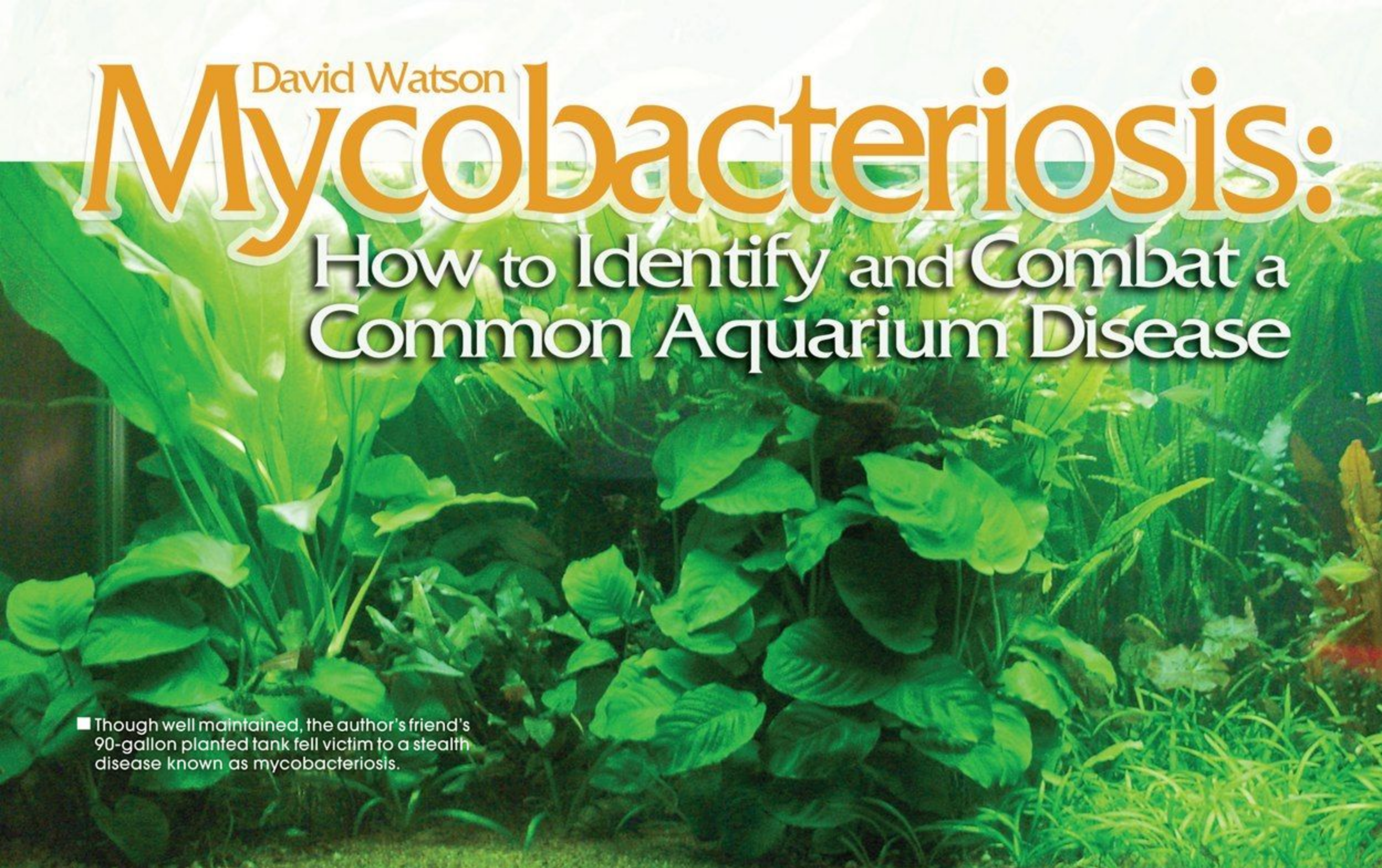


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# David Watson Mycobacteriosis:

## How to Identify and Combat a Common Aquarium Disease

■ Though well maintained, the author's friend's 90-gallon planted tank fell victim to a stealth disease known as mycobacteriosis.

One of the more difficult aspects of our hobby is knowing what to do when you have a sick fish. While my primary specialty is bovine medicine, I occasionally get calls from fellow hobbyists who have trouble pinpointing a fish disease. Having a sick fish is frustrating, and it is often coupled with the anxiety of finding the right treatment.

### Helping a Friend

This was never more evident than when a friend called for advice on her group of German blue ram cichlids (*Mikrogeophagus ramirezi*). She had lost a fish in the group about a month prior and didn't think much of it, but another fish ended up getting sick, appearing bloated and lying at the bottom of the aquarium. I arranged for a visit so I could take a look and get a better picture of the situation.

Her rams (about 15 adults that were approximately 16 months old) were housed in a 90-gallon planted aquarium. They shared the space with two adult angelfish (*Pterophyllum* sp.), a small school of lemon

tetras (*Hyphessobrycon pulchripinnis*), and a group of *Corydoras* catfish. The aquarium had a soil substrate covered with some red flint stones. Aside from the sick ram, everything appeared to be thriving.

The tank conditions were excellent, and my friend was careful about maintaining nitrate and phosphate levels for optimal plant growth. The tank had a canister filter that was cleaned monthly and a couple of powerheads with sponge filters that were cleaned weekly. The aquarium had been established for over four years. The rams were home raised and added to her planted tank about eight months prior to the outbreak. No other new fish had been introduced during this time.

The only change that had recently occurred was a new feeding regimen with a different food. My friend wanted to try to save the ailing fish. I told her it was possible that the new diet had affected the fish's digestive tract, leading to a potential intestinal obstruction resulting in the clinical sign of bloat (dropsy). I suggested separating the fish into a quarantine aquarium and treating with magnesium sulfate to relieve the bloat.

My friend called the next day to say that the fish died and she noticed another ram showing similar symptoms. We decided it was time for a specific diagnosis. I euthanized the fish and submitted the tissues to Dr. Hui-Min Hsu, the American Fisheries Society's certified fish pathologist at the Wisconsin Veterinary Diagnostic Lab in Madison. A few days later, I received the report that the fish was infected with a bacterium called *Mycobacterium*.

### Mycobacteriosis

The bacteria of the genus *Mycobacterium* have a long history of affecting both man and animal. Tuberculosis (*M. bovis*, *M. tuberculosis*) is probably the most notorious disease caused by mycobacteria. Other species, such as *M. leprae*, cause leprosy in humans, and *M. paratuberculosis* is the cause of a chronic wasting disease in cattle called Johne's.

Fortunately, the mycobacteria species responsible for infections in fish (*M. marinum*, *M. fortuitum*, and *M. chelonae*) do not cause serious disease in people. They can, however, still infect humans and cause slow-healing skin lesions.

Mycobacteriosis, the disease caused by mycobacteria, presents several important points for the aquarist to consider. First, there is no easy way to make a diagnosis without sacrificing the fish. A fish suffering from mycobacteriosis can display a wide variety of clinical signs, leading the aquarist to think other factors are in play. The list of symptoms includes pop-eye (exophthalmia), skin ulceration, bloat (dropsy), chronic weight loss, difficult breathing (dyspnea), fin and tail rot, and even increased susceptibility to ich (*Ichthyophthirius*).

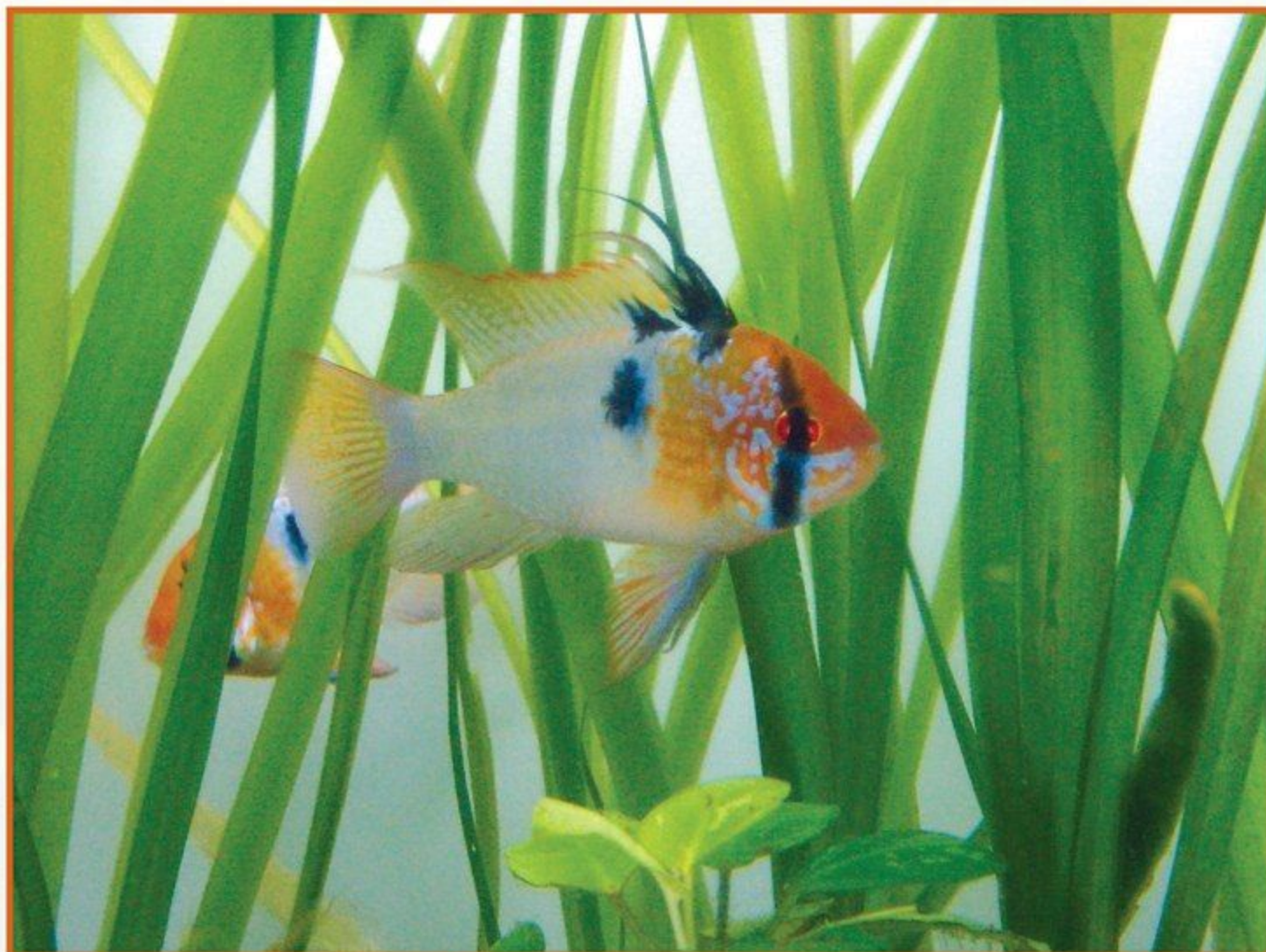
Second, because of the chronic nature of the disease, new fish introduced into an aquarium may not show symptoms until the case is full blown. Thus, even if an aquarist maintains a quarantine tank, it's possible for the disease to slip through undetected.

The mycobacterium species that affects fish is commonly found in the environment. Diana Walstad's article "Mycobacteriosis: The Stealth Disease" in the June 2007 issue of *TFH* covers the importance of competition between the normal floral bacteria in an aquarium and the ubiquitous mycobacteria. She points out the importance of this competition in preventing outbreaks. Under normal circumstances, normal floral bacteria can outcompete mycobacteria for the biofilms and other areas in the aquarium, decreasing the risk of infection.

There is no cure for mycobacteriosis, but some individual fish may be able to fight off active infections with their immune system. Factors such as age, stress level, species, and environment all play a role in how well a fish is able to fight off the disease. For example, older fish or fish living in poorly maintained aquaria would be at higher risk of succumbing to the disease.

## Staying Safe

It was hard to give my friend the bad news. Just by looking at the beautiful rams swimming through her planted aquarium, one could not tell there was a disease lurking inside her fish. With reluctance, I gave my friend the diagnosis and a couple of options to consider. She could dismantle the tank, humanely euthanizing its inhabitants, or try installing a UV sterilizer (as described by Diana Walstad in her article) in hopes of decreasing the level of mycobacteria



■ The German blue ram cichlids (*Mikrogeophagus ramirezi*) appeared healthy before the outbreak.



■ This infected ram cichlid shows the typical symptoms of mycobacteriosis infection: fin clamping, bloating, and lying at the bottom.

in her tank and giving the fish a chance to fight off the infection. However, the most important point I emphasized was the zoonotic potential of the disease.

Catching a disease from our pet fish is probably the last thing most hobbyists want to think about. As I mentioned earlier, mycobacteriosis has the potential to infect humans. The mycobacterium that causes disease in fish can cause skin infections often referred to as "fish handler's disease" or "fish tank granuloma." These infections cause localized pustules on skin exposed to contaminated water or fish (generally hands and arms), which can be slow to heal.

Having personally suffered through the problem, I can say it's something

you don't want to take for granted. Even though the chances of catching the infection are low, always take precautions when working with your aquarium. A couple of tips to consider will help reduce the risk of possible infection:

1. Wear protective gloves when performing routine maintenance.
2. Wash up with a good antibacterial soap after you are done working with your aquarium.
3. Avoid working in your aquarium if you have cuts or abrasions on your hands.
4. Make sure to clean up your hoses and maintenance tools with a good disinfectant.



■ While the cause of the disease was never determined, the afflicted inhabitants were quarantined and the spread of infection was successfully prevented.

5. Always feed, clean, and perform water changes on your quarantine or hospital tank last.

Finally, if you suspect you may have become infected, see your physician and inform him or her of your involvement with handling fish.

My friend chose to try the sterilizer approach. Unfortunately, over the next

two months, all of her ram cichlids succumbed to the disease. It's still a puzzle to me how her fish actually acquired the infection. The most common source for a mycobacteriosis outbreak is introducing an infected fish to the aquarium. But in my friend's case, she had not added any new inhabitants prior to her rams getting sick.

## Diagnosis Is Key

In my job as a veterinarian, the presentation of a disease or sickness is often quite variable. Most cases are not textbook cases or by the book. I could only speculate on how her fish acquired the disease. It is possible the new food source was the culprit, but that seemed unlikely, as it was a processed product. The other possibility was that the infection came from the aquarium environment itself. For whatever reason, perhaps due to being a long-established aquarium, the ubiquitous mycobacteria may have outcompeted the tank's normal flora, causing elevated levels of the infectious bacteria in the aquarium. Secondly, my friend's rams were constantly sparring for mates, which led to abrasions and stress that predisposed her fish to infection.

Having the diagnosis in hand, my friend properly quarantined her fish and took the necessary precautions to limit her own exposure. With multiple tanks in her fishroom, we were able to limit the outbreak to only the one aquarium. Interestingly, the two angelfish, lemon tetras, and *Corydoras* catfish residing with the infected rams never became ill and, nearly a year later, are thriving.

Having sick fish is frustrating, but it doesn't have to be. As my friend found out, working with a veterinarian helped alleviate the stress of the unknown and provided a better understanding of the disease affecting her fish. Although she lost all of her rams, my friend was able to limit the disease from spreading to her other tanks and, most importantly, took the necessary precautions to avoid acquiring the infection herself.

## Finding a Vet

If you need to contact a veterinarian for help, there's a listing of veterinarians that specialize or are interested in aquatic medicine at [www.aquavetmed.info](http://www.aquavetmed.info). Conversely, you can talk to the veterinarian who works on your family pets and see if he or she would be interested in helping you out.

## Special Thanks

I'd like to thank Dr. Hui-Min Hsu (University of Wisconsin) and Dr. Roy Yanong (University of Florida) for their help in the preparation of this article. 🐟

Photographs by the author.

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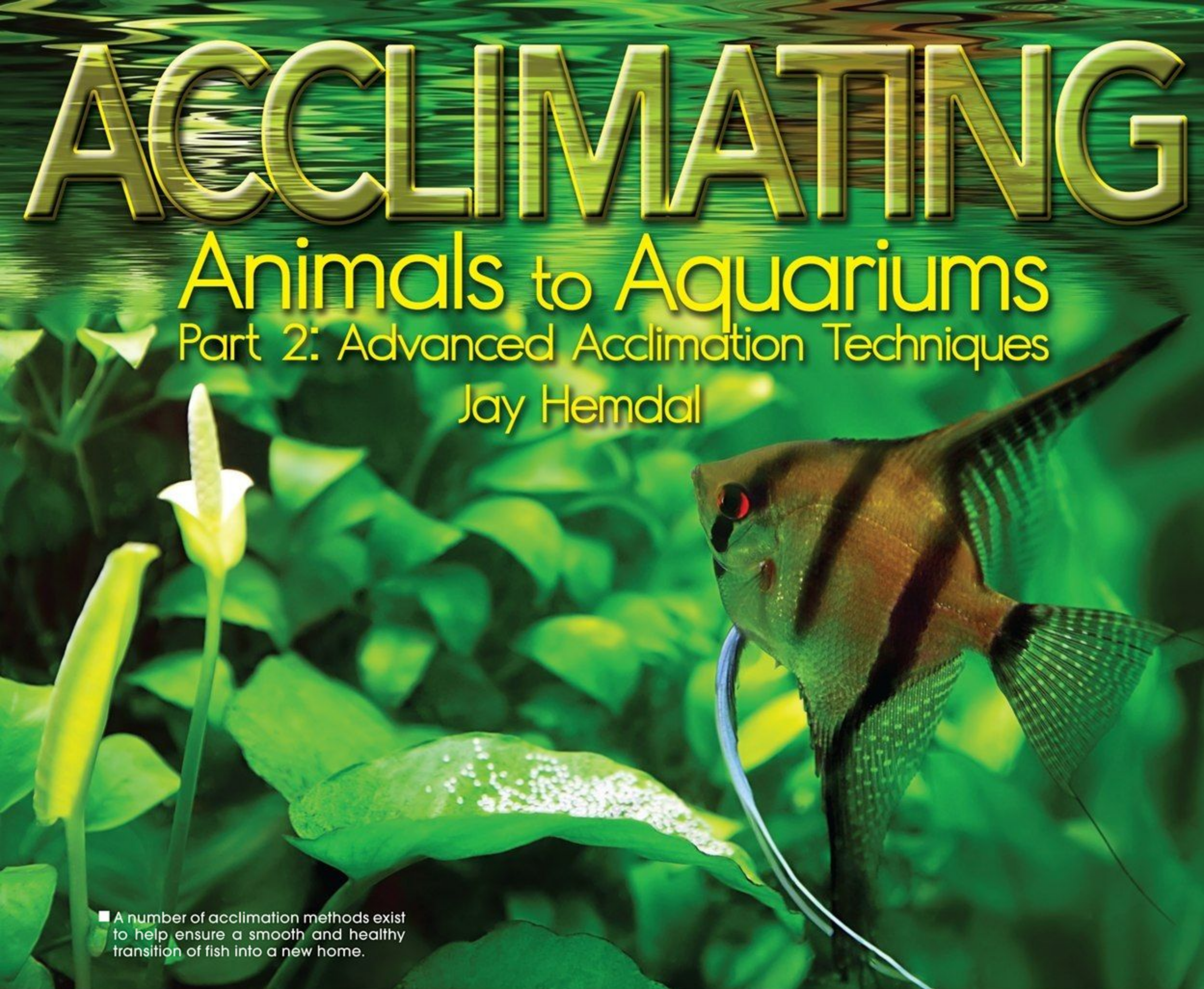
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# ACCLIMATING

## Animals to Aquariums

### Part 2: Advanced Acclimation Techniques

Jay Hemdal



■ A number of acclimation methods exist to help ensure a smooth and healthy transition of fish into a new home.

**I**n the first installment of this article (*TFH* March 2012), I described basic acclimation techniques. The second installment discusses special acclimation cases and advanced techniques.

Sometimes aquarists try to take “stress reduction” to the extreme, using acclimation times much longer than necessary. This actually increases stress in fish, especially if the dissolved oxygen level of the water is not properly maintained. Floating a sealed fish bag longer than 15 minutes (which is all it takes for temperatures to equalize) or drip acclimating fish for hours and hours without actually measuring the rate of inflowing water and the differences in water chemistry are two common errors.

#### Drip Acclimation

Setting up a line siphoning water from the main tank to an acclimation container is a common practice at many aquarium wholesale companies. These acclimation tables can assimilate huge numbers of fish into quarantine systems, dealing with high ammonia levels and other issues in assembly-line fashion.

Some home aquarists have attempted to emulate this in their home, but there are issues that must be addressed. First, the name “drip acclimation” is a misnomer. It should be termed “flow acclimation,” as the rate must be faster than a drip. If one were to set up a drip line at one drop of water per second (as many home aquarists have

assumed would be an appropriate rate), it would take 50 hours to equilibrate the difference in water parameters between  $\frac{1}{4}$  gallon of shipping water and the receiving tank to within 90 percent of each other! Obviously, the flow rate must be faster than that. A flow of one milliliter per second would result in one liter of shipping water reaching 90 percent equilibration in  $2\frac{1}{2}$  hours.

Aquarists must monitor the changing water chemistry values in the acclimation container throughout the process and adjust the flow rate accordingly. One trick is to place a few drops of methylene blue liquid per gallon of water in the acclimation container. Not only does this have some

## To Acclimate or Not: a Case History

A 3-inch Garibaldi arrived in a shipment that had been lost for 24 hours by the shipping company. The total time the fish had spent in the box exceeded 55 hours. The fish arrived moribund, on its back in the bag, but still breathing. As the shipping bag was carried to the quarantine tank, the fish stopped breathing. Unresponsive, it looked dead. Instead of tossing it out, I decided on a last-ditch effort and moved it from the shipping bag directly into the tank and held its mouth open in the effluent of a water pump. After a few minutes, it began breathing but soon stopped again. This happened two more times, but then it finally kept breathing on its own. After about four days, the fish was essentially normal. My question is this: If dumping this fish directly into a tank with a 10° temperature change and a 2 pH unit change is so stressful, why did the fish recover? It was clinically dead in its shipping water before the bag was even opened. My conclusion is that if I had tried to acclimate the fish, it would have stayed dead. Makes one wonder!

antibiotic effect and can help with oxygen transfer, but as new water flows into the acclimation container, the aquarist can judge the amount of mixing by the dilution of the blue color over time.

Just as with regular acclimation methods, as the water quality values between the aquarium and the container get closer, the rate of change slows down unless you increase the water mixing rate.

Flow acclimation systems may require adjunct aeration and heating to maintain better water quality in the acclimation container during the longer acclimation time. It also helps to use rectangular acclimation containers, as the volume can be measured using a ruler (length in inches x width x depth of water / 231 = gallons).

### Long-Duration Shipments

Animals that have been in shipping

bags longer than 36 hours build up huge amounts of metabolic wastes in the form of ammonia. At the same time, the animal has been releasing carbon dioxide into the shipping water. The combined result is that the carbon dioxide lowers the pH of the water, which, in turn, neutralizes the relative toxicity of the ammonia. Levels of ammonia at 2 or 3 parts per million and a pH of 6.0 are not unheard of.

If you acclimate these animals in the normal manner, the process will drive off the carbon dioxide faster than the ammonia is being diluted. As the pH of the water rises, the ammonia becomes toxic, often killing the animals right in the acclimation container. The key is to measure the shipping water's pH, temperature, and specific gravity (if marine). Then, using water from the tank (not freshly mixed water), create water that closely matches

all of these parameters and carefully move the animals directly into it. This is done by adjusting the specific gravity and lowering the pH with the addition of a proper amount of acid (sodium phosphate monobasic, carbon dioxide, and other acids have been used). From this point, the animals can be drip acclimated.

Always cover the acclimation container to calm the animals and keep them from jumping out. Many people simply use the foam shipping boxes the fish arrived in. These are soft and help keep the fish from bruising their snouts on the container sides, but they need to be rinsed well before use (their porous surfaces attract dirt and bacteria), and some people feel that their white coloration adds to light stress for the fish. A dedicated black plastic tub made from inert polypropylene would be a better vessel to use.



AISPIX/Shutterstock

■ One common mistake to avoid is floating a sealed bag longer than necessary, which actually increases stress in fish.



Jay Hemdal

■ A refractometer is a good way to quickly measure the specific gravity of small volumes of sea water, such as in a shipping bag.

■ Many echinoderms, such as this sputnik urchin, are very sensitive to changes in specific gravity and must be acclimated slowly and completely.



Jay Hemdal



Rebecca J. McLain/Shutterstock

■ Measurements of specific gravity are especially important for marine fish.

## A Fish in the Hand...

There is a disturbing trend in some online forums for people to tell others to avoid using nets to transfer fish, and instead to use their bare hands. While some nets are indeed rough on a fish's skin and some fish have spines that can get caught in a net's material, catching a fish with your bare hands is very tricky. There are fish out there that have venomous spines, but not everyone is aware that they do. Fish are wiggly and slippery, often escaping from a person's hand unless they are grasped tightly—something obviously to be avoided in the first place.

The safest way to transfer a fish is with a nonsnag net, held low to the ground in case the fish does manage to jump.



Sailesh Patel/Shutterstock

■ Tropical animals that are chilled are severely stressed and must be warmed up quickly.

Set up a good aeration device in the acclimation container. Next, start a siphon through a length of plastic tubing ( $\frac{3}{16}$ -inch-diameter airline tubing works for most cases) from the quarantine tank into the acclimation container. Tie an overhand knot in the airline, and adjust the tension so the water flows at the proper rate. Another option is to install an inline plastic valve and adjust the water flow that way.

### Special Acclimation Cases

There are some circumstances where you must deviate from the standard acclimation procedures.

- If animals are shipped during the winter and arrive severely chilled, open the shipping box and remove any double or triple bags. Then, lay the inner bags holding the animals on their sides in a dimly lit room. Do not open the bags or float them in water, as these actions will greatly affect proper gas exchange (primarily by trapping carbon dioxide). Once the water has warmed close to room temperature (usually within 30 minutes or so), place the bags into the receiving aquarium and proceed with the normal acclimation process. Remember, if a tropical animal is chilled, it is being severely stressed. Acclimating it too slowly out of this condition simply adds to that stress. The stress of warming them quickly is always less than the added stress of remaining chilled.
- Fish or invertebrates may arrive in shipping bags that have lost most of

their water. In other cases, they are purposefully shipped damp (anemones, corals, and some crustaceans). In these instances, the only recourse is to add the animal directly to the aquarium, as there is no acclimation procedure that can move an animal from air to water.

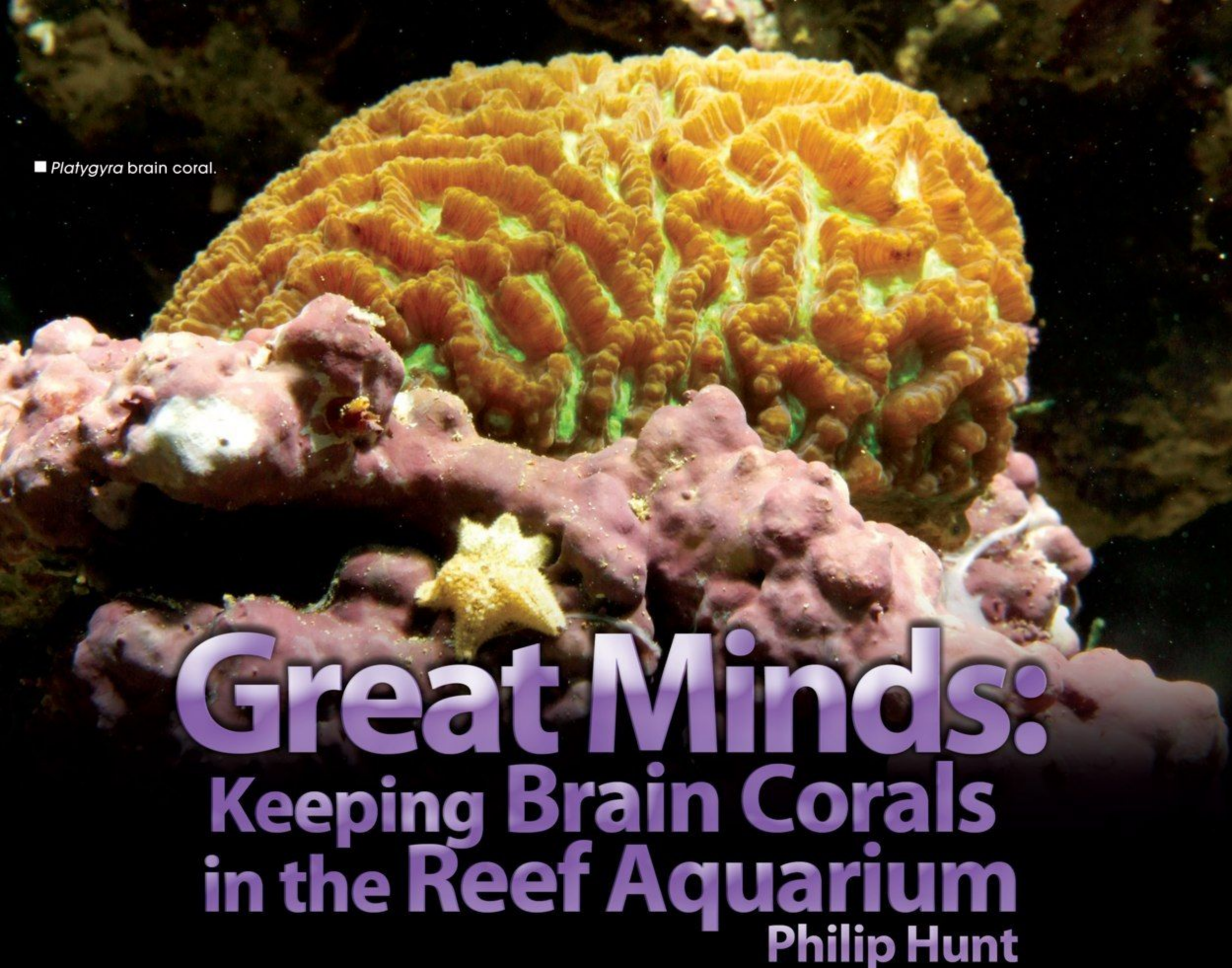
- Fish that have been in transport for less than four hours, and where there is less than a 4°F temperature change, 0.2 pH unit difference, or .0015 difference in specific gravity, do not need to be acclimated at all. Simply remove them from the transport water and add them to a dimly lit aquarium (preferably a quarantine system).
- Any animal that arrives in a moribund condition (motionless, upside down, not breathing, etc.) should be removed from the shipping water and added directly to the aquarium. Fish in this condition have been revived by gently holding their mouth open and moving them back and forth through the water to help ventilate their gills.
- Echinoderms (starfish and their kin), cephalopods, and some crustaceans are very sensitive to changes in water chemistry, particularly pH and specific gravity.
- There is a theory that smaller animals, with their correspondingly high surface-area-to-volume ratio, are more sensitive to some environmental changes. This certainly seems borne out by larval marine fishes that experience a fatal

shock if too much of their water is changed at one time.

- Marine fish do not tolerate rises in specific gravity very well. If the difference is 0.0040 or greater, consideration should be given to lowering the specific gravity of the quarantine receiving tank to more closely match that of the shipping water. Conversely, most fish handle a reduction in specific gravity very well, so moving them from high to low specific gravity can be accomplished through the normal acclimation process.
- Some large fish may require sedation with tricaine methanesulfonate (MS-222) either during capture or during transport. Knockdown doses of 75 to 150 ppm and transport levels of 25 to 40 ppm are concentrations that are commonly employed. Check the pH of the transport water after adding the MS-222, and add a pH buffer if needed.

### Proper Acclimation Is Key

Acclimation is an important technique necessary for new fish to properly adapt to your aquarium. Done properly, it takes very little time and effort. The most common mistake is when people begin to think, "If acclimation is important, then really long acclimation times will be even better." Avoid this. Stick to reasonable acclimation rates; your fish will respond well and thank you by thriving in their new home. 🐟



■ *Platygyra* brain coral.

# Great Minds: Keeping Brain Corals in the Reef Aquarium

Philip Hunt

**B**rain corals are among the most familiar types of stony coral. If asked to describe or picture a coral reef, many of us would probably mention or envision some kind of brain coral. But what are they, exactly? At an aquarium store, you may find many different species sold as brain corals of one kind or another: open brains, closed brains, lobed brains, grooved brains, folded brains, and brains without adjectives. The name has been readily applied to any coral resembling a brain in some way. This wouldn't matter so much if different names were used consistently or, most importantly, if the aquarium requirements of these diverse species were the same, but they are not.

## Types of Brains

As always, scientific nomenclature comes to the rescue to rectify any confusion and inconsistency brought upon by common names. Lobed, grooved, folded, open, closed, and even undescribed brains can be appropriately discerned as species of *Symphyllia*, *Lobophyllia*, *Platygyra*, *Trachyphyllia*, *Goniastrea*, *Oulophyllia*, and *Leptoria*, among others. When it comes to husbandry, brain corals divide themselves neatly into two groups, and corals within each group need broadly similar aquarium conditions. The first group is made up of members of the Faviidae family, such as *Platygyra*, *Goniastrea*, *Oulophyllia*, and *Leptoria* species. I'll be referring to these as faviid brains. The second is made up

of *Symphyllia*, *Lobophyllia*, and *Trachyphyllia* species. These are the classic large-polyp stony (LPS) corals, so I'll call them LPS brains. While most would include faviids among LPS corals, distinguishing between the two will be helpful for this article.

The difference between the two types of brain corals in terms of aquarium requirements is significant. LPS brain corals, while found in diverse habitats, favor calm areas, often in quite deep water or in shaded areas, and some species typically live in conditions that are far removed from the clear, nutrient-poor waters we normally associate with coral reefs (sediment-rich lagoons and bays, seagrass beds, and even muddy harbors). Faviid brain corals, in contrast, are generally found on reef flats and slopes, where they are usually

subjected to intense lighting, strong wave action, and nutrient-poor conditions.

While both types of brain corals will tolerate a range of conditions in the aquarium, it is best to provide a good simulation of the natural habitats favored by each. For LPS brain corals, this means gentle currents, bright (but not overly intense) light, and water that, while low in nutrients, is not necessarily as clean as that in a reef tank designed for small-polyp stony (SPS) corals. For faviid brain corals, moderate to very bright lighting, strong currents, and nutrient-poor water are preferred. It is no surprise that LPS brain corals were among the first stony corals that could be kept successfully in reef tanks, back in the days of trickle filters and standard-output fluorescent lighting, when faviid brain corals were regarded as hard to keep. Fortunately, advances in coral husbandry and technology since then have made keeping these faviids much more straightforward; their needs are now both better understood and easier to meet.

## Faviid Brains

In terms of species count, Faviidae is the second largest coral family after Acroporidae. This family includes aquarium favorites *Favia* and *Favites* as well as some very attractive brain corals.

Faviid colonies, which can grow very large, up to several feet wide, are made up of a large number of relatively small polyps (typically measuring up to 1 cm across). The colonies are usually massive, boulder-like, or encrusting. They often live in shallow water (though some species are found in a wider range of habitats), are sometimes exposed to the air at low tide, and are often found in areas of strong wave action.

Aside from feeding tentacles, many faviid brain corals also produce long sweeper tentacles at night that can have a powerful sting. In the wild, they can kill competing corals before growing over them. This means that plenty of space should be left around colonies in the aquarium. Feeding is beneficial for faviids and should be performed at night after the coral has switched into planktivorous mode, which is signaled by the production of tentacles. This often occurs within a few minutes of lights being turned off. Frozen crustaceans are a good food.

Identification can be an issue with faviid brain corals. While some *Platygyra* species and *Leptoria phrygia* have a very characteristic appearance, it can be very tricky to distinguish between some species, such as those of the genera *Goniastrea* and *Oulophyllia*. This is



■ *Platygyra* species corals, the most popular faviid brain corals, feature many dome-like colonies between their corallite walls.



■ The appearance of *Goniastrea* spp. and other faviid corals will change based on growing conditions.

compounded by the fact that faviid corals can change their form and color in response to growing conditions. For example, as *Goniastrea* spp. brain corals grow, the shape of their corallites (the stony cups in which the polyps grow) may change so they appear less meandering and *Platygyra*-like and more similar to those of *Favites*.

## PLATYGYRA

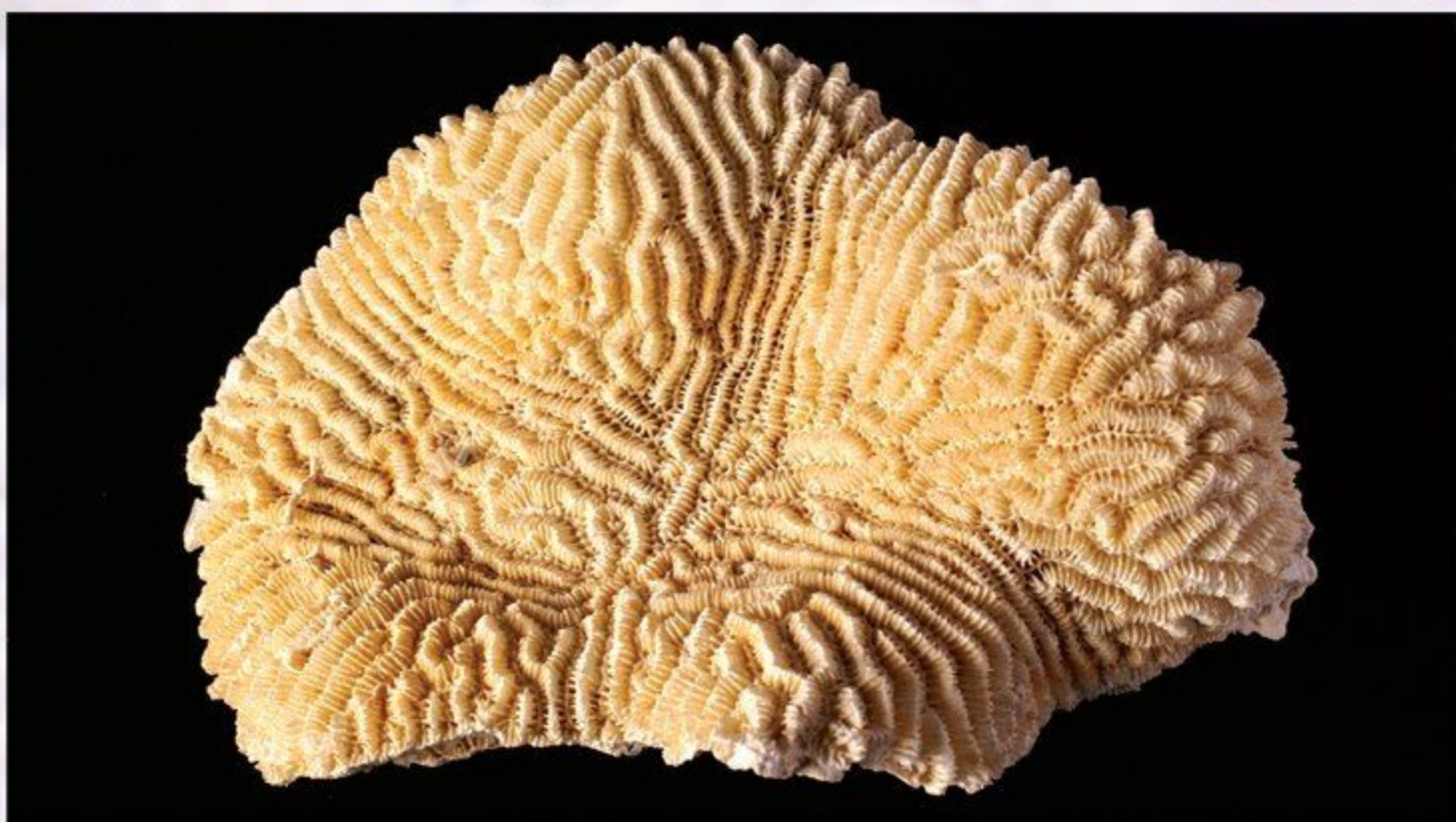
*Platygyra* corals are the best-known faviid brain corals. They typically have undulating or dome-shaped colonies, with meandering valleys separated by corallite walls. Combinations of brown and green are their

usual colors—green in the valleys, brown for the walls. Unusually colored *Platygyra* specimens are becoming more commonly available, and these may feature combinations of bright turquoise, red, and purple, as well as green and brown. The valleys in *Platygyra* spp. vary tremendously in shape. They may be short, just two or three polyps long as judged by the number of mouths, or may stretch a long way without a cross wall. They may be straight or extremely sinuous. A single colony may have both straight and sinuous and long and short valleys.

*Platygyra* corals can be a little more difficult to keep in the aquarium than some of their



■ *Trachyphyllia radiata*; one of the typical reasons for tissue recession in corals is improper lighting.



■ *Platygyra* skeleton; the identification of coral species can be difficult unless a cleaned skeleton can be examined.

relatives. They are particularly prone to bleaching and are quite susceptible to brown jelly infections.

### GONIASTREA

Usually found as dome-shaped colonies, *Goniastrea* spp. vary a lot in how brainy-looking they are. Some, with very meandering valleys, look almost like *Platygyra* spp. (though their valleys are generally less sinuous and the ridges between them are more prominent), while others have a closer resemblance to *Favites* moon or pineapple corals. This can make it very difficult to identify them, especially while they are alive. Cleaned skeletons allow for more positive identification. Often in muted shades of

brown and green, *Goniastrea* spp. tend to be less strikingly colored than *Platygyra* spp., though some specimens will develop brighter colors when kept in strong light. *Goniastrea* spp. have the advantage over *Platygyra* spp. of being more resilient in the aquarium, however, as they are seldom troubled by the problems that sometimes affect their relatives. *Goniastrea* spp. also have a powerful sting and need to be given a clear buffer zone around them; otherwise, neighboring corals can be badly damaged.

### OULOPHYLLIA

*Oulophyllia* spp. are probably less common in the aquarium trade than *Platygyra* and *Goniastrea* spp., though it is not always easy

to distinguish the different species. They are both attractive and usually straightforward to keep. One feature that can help distinguish *Oulophyllia* spp. from their relatives is that the winding valleys between their corallite walls tend to be very wide, often quite short, and can be noticeably V-shaped. Unlike most other faviid brain corals, they seem to prefer protected sites in the wild and are less demanding of strong currents in the aquarium. Their usual colors are brown, green, or cream, sometimes with contrasting valleys and ridges.

### LEPTORIA PHRYGIA

Rarely seen for sale and usually expensive, *Leptoria phrygia* (the sole species in its genus) is a very beautiful coral. It is typically dome shaped, with long, very narrow, and often very sinuous valleys. This species is usually brown, green, or cream in color, with strikingly contrasting valleys. It is rarely collected because it tends to be found on outer reef slopes and wave-battered reef crests, areas that are not easily accessible to collectors. In the aquarium, it needs strong water movement and very low nutrient levels. It also needs plenty of space, as it is a very aggressive species that can inflict significant damage to neighboring corals.

## LPS Brains

### TRACHYPHYLLIA

The two species of *Trachyphyllia* (*T. geoffroyi* and *T. [Wellsophyllia] radiata*) are old favorites of reef aquarium keepers, and with good reason. Both are often found in shades of green and brown, though red is another common color. Most specimens are multicolored and feature markings of purple, blue, turquoise, and orange. Colors and patterns vary tremendously between individuals, and the most dazzling specimens can command very high prices. *Trachyphyllia* often fluoresce brightly under blue light from actinic lamps or blue LEDs.

*T. geoffroyi* has a skeleton that is roughly conical, the top being flattish and almost circular in young specimens, growing to a kind of figure eight with age. In the wild, this species is often found on sand or mud sea beds, with the skeleton buried in the substrate. *T. radiata* is much more convoluted and brain-like, and the skeleton typically has a flat base. Like *T. geoffroyi*, it is often found on mud or sand sea beds. Both *Trachyphyllia* species can inflate their tissues tremendously, which not only serves to increase the surface area available for photosynthesis but also



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allows a coral to remove silt from its surface. They deflate somewhat at night and produce feeding tentacles, and they can accept quite substantial food items. Both species are found at a variety of depths, from around 6½ feet to over 100 feet. Both species are relatively small, seldom exceeding 8 inches across.

In the aquarium, both *Trachyphyllia* species are generally hardy and long lived if kept in the correct conditions. The main threat to them is fishes. Species that have even a slight inclination to eat corals will munch on *Trachyphyllia*. Feeding *Trachyphyllia* (with krill or mysid shrimp, for example) seems to benefit them, though that can mean having to spot feed them after dark with a turkey baster and it can be tricky to keep fish and shrimps from stealing the food.

Of all brain corals, *Trachyphyllia* spp. are perhaps best suited for smaller aquariums or nano-reef tanks due to their small size and slow rate of growth.

### LOBOPHYLLIA

There are several species of *Lobophyllia*, and all are difficult to identify to the species level. Like *Trachyphyllia* spp., they are generally robust aquarium corals but share some of the latter's vulnerability to picking and grazing by fishes. In some *Lobophyllia* species, the polyps are found at the ends of separated skeletal branches (a phaceloid colony form), though this is not obvious when the polyps



■ *Trachyphyllia geoffroyi*; brain coral species are usually available in a wide array of colors.



■ With their spiky, scaly textures, *Lobophyllia* spp. are some of the more aggressive-looking brain coral species.

are expanded. The convoluted shapes of the expanded polyps give the colony its brain-like appearance. Other species have flabello-meandroid skeletons like those of *Trachyphyllia*. The skeletons of *Lobophyllia* can be very spiky, with sharp teeth visible through the soft tissue.

While many *Lobophyllia* spp. are soberly colored in browns, grays, and beiges, green and red specimens are quite common. Rarely, orange, yellow, or turquoise morphs are found, and some individuals can include any combination or all of these colors. While *Lobophyllia* corals are generally inexpensive, these rare, highly colorful specimens can fetch very high prices.

In the wild, *Lobophyllia* spp. are most often found on reef slopes, but they typically reside in protected, and sometimes shaded, locations. They can form rather large domed colonies attached to hard substrates. In the aquarium, they enjoy the same calm conditions as *Trachyphyllia* spp. but tend to like somewhat more intense light.

### SYMPHYLLIA

Generally looking more brain-like, with more obvious ridges and meanders than *Lobophyllia* spp., *Symphyllia* species are found in similar reef areas—sheltered locations on reef slopes, but more often in shallow water. Colonies are typically shaped like domes or are sometimes flattish. The walls of individual corallites are fused together in *Symphyllia* spp., and these form the meandering ridges that give these corals their brain-like appearance. The tops of these ridges have a characteristic groove along them. In the aquarium, the conditions favored by *Lobophyllia* and *Trachyphyllia* spp. also suit *Symphyllia* spp. well. *Symphyllia* corals are usually soberly colored in browns, beiges, grays, and greens, but the valleys often have a contrasting shade to the ridges, and the groove on top of the ridge is often marked in another color. In recent years, more vividly colored specimens have become available, with orange, red, and purple markings, often with contrasting colors on ridges and valleys, but these are very expensive.

More aggressive toward their neighbors than other LPS brains and more resistant to the stings of other corals, *Symphyllia* spp. need some clear space left around them. They also produce feeding tentacles readily in response to food, even in daylight, and benefit from regular feeding.

### Trouble in Mind

When kept in their preferred conditions, both LPS and faviid brains are hardy and

can live long in the aquarium. One of the first corals I kept for over a decade was a *Trachyphyllia geoffroyi*. This is not to say, however, that these corals lack any sort of trouble. They can suffer from a number of different problems.

### BLEACHING

Bleaching, where corals expel their zooxanthellae and become white or transparent (aside from retaining fluorescent pigments), occurs in all kinds of brain corals, in the wild as well as in the aquarium, usually in response to high water temperatures (typically over 90°F). In most cases, the bleaching is reversible, with the coral regaining its color over a period of a few weeks as it acquires new zooxanthellae. It's useful to feed corals regularly until they recover, as without zooxanthellae, they cannot gain any nutrition from photosynthesis and have to depend entirely on food capture.

### TISSUE RECESSION

Tissue recession occurs in both LPS and faviid brains, but it takes different forms. In faviid brain corals, tissue typically recedes from around the base of the colony, exposing the skeleton closest to the substrate on which the coral is sitting. This may occur if the coral is not getting enough light or if the tissue gets buried in sand. In such cases, the upper part of the coral may be growing well, even as tissue is disappearing from the base. Where the coral is shaded on one side but lit more brightly on the other, there may be good growth where the light is more intense while tissue is receding from the opposite side. In effect, the coral is using growth and recession to move itself to a more favorable spot.

Not all tissue recession is so benign, however. Other causes may be stinging by neighboring corals, in which case the tissue is lost from the side nearest to the aggressor and will take the form of a patch, perhaps surrounded by healthy tissue. A more extreme form of tissue loss occurs when water conditions are very poor or if light levels are far too low, or, paradoxically, if the light level is suddenly increased greatly. Under excessive light, the tissue that joins the individual polyps disintegrates and the individual polyps shrink back into the corallites before disappearing altogether.

In LPS brain corals, tissue recession often resembles this latter problem with faviid corals. An LPS brain coral may consist of a single large polyp, and the tissue shrinks back into the corallite, exposing the skeleton around the



■ Black lights can be used to bring out the fluorescent coloration of corals.

edges. Causes may be too little or too much light, poor water conditions, lack of food, or repeated nibbling by fish.

Dealing with tissue recession is mainly a matter of getting the environment right for the individual coral. This may involve moving the coral to a spot with more or less light or water movement, or it could mean improving the water quality of the whole aquarium. Freshwater dips (as described below) can sometimes help, perhaps by preventing secondary infection. To know whether your measures have succeeded, look at the edge of the coral tissue where it meets the skeleton exposed by recession. For both LPS and faviid brain corals, you need to see a firm, distinct edge of healthy-looking tissue.

### BROWN JELLY INFECTIONS

Brown jelly infections, as the name suggests, take the form of slimy, brown, gelatinous material appearing on the surface of the colony, usually in a discrete area, with destruction of the coral tissue beneath. It tends to occur on damaged parts of the coral but can affect apparently healthy tissue. A protozoan known as *Helicostoma* has been isolated from brown jelly infections, but it is unclear whether it is the cause. Left untreated, brown jelly infections can overcome whole colonies. Among brain corals, *Platygyra* spp. seem to be more susceptible than other species.

While some authors recommend antibiotic treatment, this can be hazardous to both coral and keeper. A simpler method is to use freshwater dips, as this is often effective, if not a guaranteed cure. To do this, the coral (or the affected area) is immersed in water that is at the same temperature and pH as the aquarium water. This can be achieved by floating a bag

or bowl of fresh water in the aquarium for about 30 minutes (to get the temperature right) and adding a small quantity of a marine buffer (just a pinch per liter of water is usually enough) to get the pH in range.

It's best to use purified water (reverse osmosis or deionized) rather than chlorinated water straight from the faucet. Some authors suggest adding iodine (in the form of an aquarium iodine supplement) as an anti-infective, but it is unclear whether this is better or not. I'm not aware of any controlled experiments. Both faviid and LPS brain corals will usually tolerate freshwater dips of up to five minutes, but proceed carefully, as individual corals may vary in this respect. After dipping, return the coral to the aquarium and discard the dipping water. Many brown jelly infections will need repeated dips. I've found that doing a daily dip for a week seems to work, but I don't have any statistical basis for this because I haven't treated a lot of cases. Successful treatment is indicated by the disappearance of any gelatinous material and by the appearance of a clearly defined edge to the tissue.

### NUISANCE ANEMONES

Despite the sweeper tentacles and stinging ability of many faviid brain corals, nuisance anemones (*Aiptasia* and *majanos*) can cause them problems. These anemones favor settling on exposed areas of coral skeleton, and if they grow on the edge of a brain coral, they can damage the live tissue, possibly to the point where brown jelly infections start. Keeping these pests under control is good practice anyway, but removing them from the edges of brain corals is particularly important. 🐠  
Photographs by the author.

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■ Fuzzy lionfish (*Dendrochirus brachypterus*).

# The DWARF LIONS

Bob Fenner

**D**warf lionfishes are definitely a case where good things come in small(er) packages. One advantage is that they are not as likely to swallow small fish and nonfish tankmates, but beware—their gulp is larger than it may seem, and many fishes and invertebrates are inhaled daily by these diminutive scorpionfishes.

Another caveat: Size bears little relation to the power of their sting. Like small rattlesnakes, small lionfish are just as venomous as their larger brethren, so watch where you put your hands when working in their tanks!

### Dwarf Lionfishes on Parade

The dwarf lions are generally considered to include four of the five members of the genus *Dendrochirus*, though at least one of the smaller *Pterois* spp. is labeled as such because of its smaller size and more sedentary, bottom-dwelling habits.

#### HAWAIIAN LIONFISH (*DENDROCHIRUS BARBERI*)

The Hawaiian lionfish (*D. barberi*), also known by divers as the green lionfish, is found in the eastern central Pacific in Hawaii and the Johnston Atoll. It is found anywhere from 3 to 165 feet down, generally resting on coral or in rocky recesses, and reaches about 6 inches in length. As I mentioned earlier, be aware of the powerful venom it releases when touched.

#### *D. BELLUS*

*D. bellus* comes from the northwestern Pacific, Japan and Taiwan, and is never seen in the trade. It reaches 6 inches in length.

#### TWO-SPOT LION (*D. BIOCELLATUS*)

*D. biocellatus* goes by many common names, such as two-spot lionfish, twin-spot lion, and Roo or Fu Manchu lion. But no matter what it is called, it is unmistakable, with its two eye spots on the rear dorsal fin area and two whisker-like appendages extending from the lower jaw. Able to reach almost 5 inches in length, this is a widespread species found throughout the tropical Indian Ocean to the western Pacific.

#### FUZZY LIONFISH (*D. BRACHYPTERUS*)

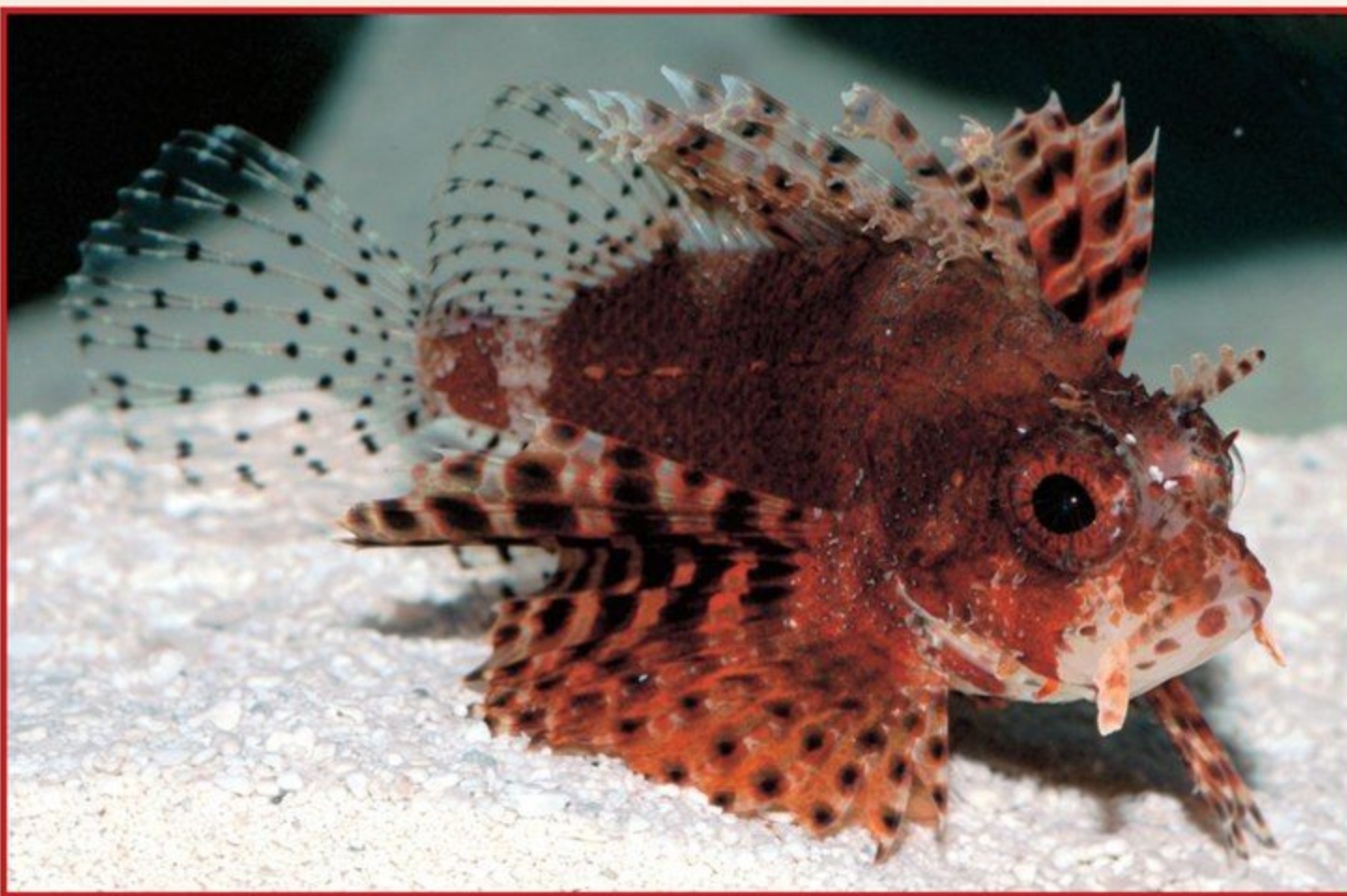
The shortfin dwarf or fuzzy lion (*D. brachypterus*) is a rarer, more heavy-bodied dwarf. It often shows up with a good deal



■ The most common dwarf lionfish, the zebra turkeyfish (*D. zebra*), can be identified by two white spheres that adorn its caudal peduncle.



■ Hawaiian lionfish (*D. barberi*); though diminutive, dwarf lionfishes are just as venomous as their larger brethren.



■ *D. brachypterus*; dwarf lionfishes are typically inactive for most of the day, but they will still require large living quarters with extensive filtration, aeration, and circulation.

of yellow, brown, and green mixed with red markings. This dwarf is aptly named because it has very large pectoral fins with almost no emerging ray tips. The fish is found in the Indo-West Pacific, from East Africa to the Red Sea to southern Japan, Australia, and Micronesia. It is one of the most personable marine species, quickly

recognizing and responding to its owner's presence.

#### **ZEBRA TURKEYFISH (*D. ZEBRA*)**

The zebra turkeyfish (*D. zebra*), the most common dwarf lion, is similar in many ways to *Pterois antennata* and *P. sphex*. The one sure way of identifying this species is



■ *D. zebra*; different dwarf lionfish species can usually be kept together without any problems.



■ The two-spot or Fu Manchu lionfish (*D. biocellatus*) is famous for its whisker-like appendages.

by checking for its distinguishing mark: two white spheres on its caudal peduncle. It is found in the Indo-West Pacific—the Red Sea, East Africa, to Southern Japan, Australia—and reaches 10 inches in length.

#### **A SMALLISH PTEROIS LIONFISH**

There are also a few “true” lions that could be considered dwarves, and I definitely consider *P. sphex* to be one. It is a Hawaiian endemic that is often mistakenly sold as an *antennata* lion, which it closely resembles in terms of pectoral finnage. The fins of *P. sphex* are shorter, less colorful, and more clubbed in appearance. Though more costly than the majority of lions, which are imported from the Philippines and Indonesia, Hawaiian lions are my favorite for hardiness. This one reaches 8 inches in length.

#### **Selection**

For the most part, lionfishes are easily captured (they don't swim quickly and are easily found in the wild), but they do take a beating on their way to dealers. For large fishes with sizable appetites, they are rather sensitive to ammonia poisoning and low oxygen concentration. I recommend that you follow these guidelines when purchasing a lionfish:

1. Don't buy newly arrived specimens—let the poor fish rest up from being collected for a few days to a week, as they are all wild captured. Most all anomalous losses of these fishes occur within a few days of collection and transport.

2. Don't purchase individuals that appear spaced out. Healthy specimens are bright eyed, alert, aware of your presence, and not cowering in the corner. They also don't have cloudy eyes.

3. Avoid specimens with red markings or open sores. Torn fins (they get broken



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Rich Carey/Shutterstock

■ *D. brachypterus*; one way to entice lionfish to take nonlive foods is to attach such fare to a feeding stick and dangle it in front of their faces.

in collection) are fine and will mend, but look out for bad scrapes and infected lateral lines. Look particularly at the fin insertion areas of the body for tears and evidence of bleeding. Most damaged individuals will heal, but it's best that they not be moved about when they are so impugned.

4. Hold off purchasing fishes that don't eat at your local fish store. This old piece of advice is a valid yes/no decision maker for purchasing lions. A healthy lionfish will always show interest or, at least, awareness of potential food items in its vicinity. If one you have your eye on won't take food in front of you, put it on layaway with a deposit and come back for it at a later date when you can see it feeding.

## Systems

Despite the prevalent belief that lions don't need to be put into large tanks with extensive filtration, aeration, and circulation because they just sit around, they do need all of those things. Although they are quite sedentary, dwarf lionfishes

are messy in terms of the foods they consume and the wastes they produce. Their size and weight are also considerable in light of their small build. My friend and Wet Web Media member James Gasta has a good rule of thumb for marine stocking—one cubic inch of life per 5 gallons of water. Given this measure instead of the oft-repeated length per so many gallons, you can see that bulky lionfish species need room. I would not put one of these fishes in less than a 40-gallon system.

Filtration, likewise, needs to be high quality, allowing for both the steady secretion of ammonia from the fish's gills and the periodic expulsion of solid and liquid wastes. Similarly, their water needs to be maintained in a highly oxygenated state, with vigorous circulation.

Though it's not talked about often, lionfish can and do modify the water they're in at times, sometimes to disastrous degrees. Alkalinity and pH, in particular, often slide with systems housing lionfish. Even given a decent volume of water,

plenty of calcareous substrate, and calcareous rocks in their tank, your aquarium can have a precipitous slide in buffering capacity without regular partial water changes. Do keep an eye on your pH and dKH.

Lastly, I want to include a stock mention of lighting and scorpaenid (mail-cheeked) fishes. They are susceptible to a blinding syndrome as a consequence of being placed in overly bright settings that lack caves and overhangs. If you detect cloudiness in your lion's eyes, I'd first check (and rectify) the pH, but then look to providing shade or moving this fish from an overlit tank. Provide sufficient cover, caves, and overhangs for your dwarf lions to hang out (upside down or right-side up). This is what they do in the wild during the day.

## Tankmates

There are two basic rules to matching livestock with dwarf lions—make sure to avoid anything small enough to fit in their capacious mouths and, secondly,

don't include anything that will harass them. The first category includes motile invertebrates—small crabs and shrimps—as they can all be inhaled. Larger basses, eels, triggers, puffers, big angels, and some other miscellaneous fishes may pick on your small lion to its demise.

Unlike the case with some of the *Pterois* species, dwarf lions rarely (but can) show intraspecific aggression and are, in fact, often encountered in loosely associated groups in the wild. More than one species may be housed in the same system, given adequate space, food, etc.

## Feeding

Small lionfish species enjoy chunky, meaty foods. That means live food in the wild, but they can almost always be trained to accept cut meat or freeze-dried and frozen items in captivity. Be aware that this may take some work on your part and include periods of starvation on their part. These fishes can, indeed, go without food for a few to several weeks. Don't give in to the foolhardy practice of feeding them freshwater feeders—comet goldfish, livebearers, rosies—because they are poor in nutrition, expensive, inconvenient, and the hands-down number-one killer of these fishes from either fatty degeneration internally over time or outright gut blockage.

If your lion is getting too thin and looking starved, a live glass or ghost shrimp will likely be readily accepted. Otherwise, devise a feeding stick (wood or plastic) that you can attach nonlive food items to and practice waving these meaty food offerings (silversides, lancefish, shrimp—whole or in pieces) in front of your lion's face toward the evening (most are crepuscular to nocturnal ambush predators). You will have a fine aqua pet in time.

Feeding them twice a week is about right, but never feed to satiation, as you don't want to make the lion look or feel like a living balloon.

## Diseases

Though far more lionfishes, both small and large species, are killed from misfeeding (largely feeder goldfish) and self-caused pollution from being in aquariums too small, they are susceptible to the usual reef fish maladies, particularly *Cryptocaryon* and *Amyloodinium*. Being sensitive to variable water quality also includes an aversion to typical medications, so any



Sergey Skleznev/Shutterstock

■ *D. zebra*; dwarf lionfish have a tendency to alter water conditions, so a close eye should be kept on pH and other important parameters.

containing copper compounds, formalin, and dyes like malachite green should be administered in the lowest possible physiological dose. And even then, the animals should be watched closely for signs of over treatment and new water should be kept ready for changes if needed. Protozoan and dinoflagellate diseases can often be eradicated with a simple pH-adjusted freshwater and half-dose formalin dip/bath enroute to a treatment/quarantine tank, allowing the main/display tank to go fallow for a month while the parasites die off or lose pathogenicity.

A note to dealers: An extended bath or full treatment (250 mg/10 gallons) of nitrofurazone can often result in miraculous reincarnation of badly beat-up, fin-tattered specimens that arrive to you in very poor condition.

## Reproduction

Lionfishes, including dwarf species, have spawned in captivity, particularly *D. brachypterus*. They do so in the wild

in a harem condition, with one male and a few females. In breeding condition, females swell with eggs. Spawning occurs by dark of night; the sticky egg mass floats toward the surface, and a day and a half later, the gelatinous mass dissolves and the developing fry take food.

## Keep a Dwarf Lion

Dwarf lionfish species really differ from their larger, related kin only by size and a propensity to sit at the bottom more. The smaller lionfish species require the same good-sized, well-filtered, and aerated systems as the bigger ones. They can be similarly trained to eat nonlive foods and are harmed by the same inappropriate live freshwater ones.

As with the larger “true” lionfishes, one must be cautious when having their hands in these fishes' tanks. Whether they're alive or not, all lionfish species are painfully venomous. Keep your eye on these fishes when working in their tanks. 🐠 Photographs by the author except as noted.

# UNZTD

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**I**n recent years, there have been astonishing advances in our understanding of ocean life as well as the technology necessary to promote ocean life in aquaculture. This includes large-scale farms and aquariums, public and private. But despite these improvements in knowledge, certain sea life still sinks into the abyss on occasion. The reasons may vary from poor collection techniques to inappropriate shipping methods to a simple lack of knowledge concerning a species' requirements in captivity. Sea pens fall mostly into the last category.

■ Resembling giant feathers, sea pens are among



A sea pen? That's right! Most aquarists have never even heard of a sea pen, let alone seen one. It would stand to reason that the difficulty in keeping or propagating sea pens begins with a lack of information. Make no mistake, there are several good books that cover this species, but for the most part, introductory-level books do not include sea pens, and the books that do cover them do so only briefly. To further compound this lack of knowledge, sea pens are also rarely offered in retail stores, which keeps the demand for husbandry literature minimal. The ones offered for sale often die in retailer holding tanks or are purchased on impulse time and again without apposite facts of their husbandry needs in the home aquarium. This irresponsible behavior often ends with the sea pen dying in a few short weeks, or sometimes even days.

Sea pens are solitary corals with unbranched colonies that look very similar to an old quill pen. They are cnidarians, and along with the true soft corals, gorgonians, and sea fans, they form the subclass Octocorallia, or octocorals. Octocorals are corals whose polyps each have eight tentacles. There are currently 14 families and approximately 280 to 300 species of sea pens. New ones are always being discovered. In fact, several months ago, *Anthoptilum gowletthomesae* was officially acknowledged as a new species of sea pen that is distributed off the Australian coast. It attaches to rocky surfaces instead of burying its peduncle (lower part) in the substrate. Despite the vast number of species, many of these never see the artificial light of an aquarium. For that reason, the content of this article will focus on the species that is not only the most commonly encountered but also the best suited to aquarium life: *Cavernularia obesa*. It's also worth noting that, with the possible exception of water temperature, the care for one species will generally be the same as it is for the rest of the species.

On the whole, sea pens have an extensive distribution, but individual genera and species may live only in restricted areas. They are documented to occur throughout tropical and temperate waters worldwide. Sea pens seldom occur above depths of 33 feet. Turbulent, shallow water would surely disturb them, so they favor deeper locales where rough water won't uproot them.

## Difficulties in the Aquarium

Sea pens have a low survival rate in captivity, as their aquarium requirements are different from many other corals in the hobby. The greatest cause of death in sea pens is a lack of understanding of a few very important, yet basic, simple-to-meet needs that will allow this beautiful coral to thrive: proper substrate depth, water movement, and food supply.

Another contributing factor to their poor survival rate is rough collection and handling, which is a major stress inducer. When selecting a sea pen, choose one that has its peduncle buried, is erect, and has its polyps extended. Avoid specimens that exhibit lesions and signs of illness or infection.

Sea pens have a skeletal structure similar to that of gorgonians and sea fans to support the colony, and their skeletons are calcium based like the vast majority of stony coral skeletons are. The skeleton is a very thin central axis rather than a large mass like small-polyp stony (SPS) and large-polyp stony (LPS) corals have. Because of its toothpick-thin diameter, the structure is fragile and easily broken. When the thin skeleton is broken, sea pens rarely recover.

The information presented in this article is intended to increase the likelihood of success in keeping this species. Nevertheless, responsible aquarists will take a step back from their retailer's aquarium and ask themselves if their aquarium and their experience



Naturediver/Shutterstock

■ The health of a sea pen can be gauged by the firmness of its stature.

will allow them to properly care for such a coral before even considering taking on one of these wonderful invertebrates. Simply put, these corals are not for everyone. But dedicated aquarists that acquire healthy specimens and know how to meet the husbandry needs of this species will be greatly rewarded.

## Background

Sea pens inhabit soft sand or mud bottoms and look very similar to an old quill pen buried to the plume in the sand. The lower portion of the body is the primary polyp or muscular peduncle that buries into the bottom and helps anchor the animal in the substrate. A feathery group of polyps located on the rachis (upper portion) is then erected directly above the substrate into the water column.

A single sea pen can have thousands of individual polyps—a large, mature specimen can easily have 40,000 or more! The polyps on sea pens may be broken down into two different types based on specialized functions. Without these dedicated polyps, the colony would not survive. Gastrozoid (autozoid) polyps secure food by using nematocysts (stinging cells) to catch plankton like many coral polyps do. Siphonozoid polyps force water in and out of canals that promote respiratory ventilation. All polyps are capable of producing gametes during reproductive cycles.

Another really cool characteristic of sea pens is their ability to produce light. Sea pens are capable of producing fast flashes of bright, greenish light, similar to that of a lightning bug, when touched or mistreated. Practice restraint in encouraging this display of bioluminescence,



Bill Rosser

■ Commonly found and best suited to aquarium life, many consider *Cavernularia obesa* to be the ideal species for home setups.

though, as the production of bioluminescent light is a taxing response to stress. Sea pens that display frequently often exhibit decreased growth rates, poor polyp extension, and even death.

## Aquarium Requirements

### SETUP

A fine substrate at least 5 inches deep is a necessity, though a substrate of 8 to 10 inches (or even deeper) would be much better. Avoid coarse coral and sand, as these are abrasive and irritating to the peduncle. Prolonged exposure to a rough substrate will lead to an early expiration of most sea pens.

While generally sessile, if need be, sea pens can relax their peduncle and release their anchor, then move themselves to a more suitable location. They position themselves advantageously in the path of mild currents that provide them with a reliable source of plankton. As stated, for proper support of their peduncle and rachis, a deep substrate is needed. If an aquarium lacks a deep substrate bed, the sea pen is sure to expire. In addition to supporting the coral, deep substrate beds also promote the growth of large populations of planktonic microfauna, which sea pens require as part of their diet. Since sea pens naturally occur in deeper locales to avoid turbulent water, the aquarium should also have gentle water movement. As long as an aquarium can aesthetically support a very deep substrate bed, the tank itself does not need to be deep, but the water should be calm yet well circulated. In addition to the filter's return current, low-current powerheads can be added to keep the water well circulated, all the while allowing the sea pen to fully open and extend without being battered by strong currents. Aquariums equipped with spray bars tend to be greatly appreciated by sea pens.

Ideally, sea pens should sway gently in a vertical orientation. If the sea pen is frequently being pushed horizontally or diagonally, the current is likely too strong. Another indicator of excessive current is if the sea pen constantly detaches its foothold from the substrate and is free floating in the water current or not anchored at all.

### FEEDING

Sunlight rarely penetrates efficiently in the habitats where they are found, so *Cavernularia* lack zooxanthellae and are not dependent on light for survival. Zooxanthellae are microalgae that form a symbiotic relationship with many corals and a smaller handful of greater invertebrates, such as clams of the genus *Tridacna*. They perform photosynthesis, and the nutrients created become a food source for the host. Due to the absence of zooxanthellae, *Cavernularia* spp. are not capable of producing their own energy. Therefore, sea pens need to extract nutrients from the bountiful ocean currents via various drifting plankton. Without this source of plankton, sea pens would unquestionably perish because they have no means to produce their own source of nutrients.

Naturally, *Cavernularia* colonies are at the mercy of the sea, feeding upon whatever plankton drifts into their polyps. In the ocean, they feed largely on an array of detritus, ciliates, as well as miniscule crustaceans.

In the aquarium, acclimated sea pens are greedy feeders and will consume most meaty foods of the appropriate particle size. They must be fed heavily with planktonic food, such as rotifers and cyclops, on a regular basis. The majority of stores that cater to reef aquariums will have a vast assortment of dry and frozen foods or formulas that are manufactured specifically for corals. They should be offered food at least twice a day. In an aquarium equipped with aggressive filtration, a food drip consisting of phytoplankton and zooplankton is a good way to provide a constant supply of food. This of course should be supplemented with the other foods mentioned. A quality vitamin supplement is suggested.

### WATER PARAMETERS

Sea pens flourish in an environment where the specific gravity is between 1.024 and 1.026. The pH must be maintained at 8.3 and 8.4. Alkalinity should be between 9 and 15 dKH, and the concentration of calcium should be no less than 420 ppm and no more than 500 ppm.

To keep the tank clean and the corals healthy and thriving, dissolved organic matter should be kept as low as possible. Most importantly, ammonia and nitrites should be zero. Nitrates should linger as close to zero as possible, though they are acceptable up to 10 ppm. Phosphates should be no higher than 0.3 ppm, but it is better if they are at an untestable concentration. To achieve these goals, a combination of activated carbon and protein skimming should be incorporated into the aquarium's filtration design; both will do an extraordinary job at removing wastes from the system if properly maintained.

*C. obesa* will thrive in temperatures between 77° and 80°F. It is important that the temperature does not fluctuate more than 2° in a 12-hour period, and it should stay within the mentioned parameters.

### PLACEMENT

When placing a new sea pen into an aquarium, avoiding other species and providing room to grow is paramount. That said, trying

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■ One way to keep sea pens from drifting from one location to another is to reduce pump activity.

to place a sea pen in a specific spot and getting it to stay there is likely to be challenging. Many hobbyists have found themselves banging their heads against the aquarium out of frustration trying to accomplish this feat!

To help encourage a sea pen to take a foothold in a chosen area, reduce or even turn off the pumps to keep it from drifting. Try restraining it with an appropriately sized, inverted piece of plastic or glass placed over it until its peduncle is buried in the substrate. Leave the pumps' power reduced for an hour or so afterward to allow some acclimation time. If at all possible, gradually increase the water's current to further allow for acclimation. Otherwise, a sudden overwhelming force of water may cause the pen to release its hold and float away. Don't forget to turn your pumps back on eventually!

Providing an adequate amount of space between sea pens and other corals in a reef is often overlooked. For healthy, noncompetitive growth, allow at least 6 inches of space between corals and provide good water movement and strong filtration to remove shed layers of dangerous mucus. Corals that are kept in close proximity to other species are subject to various types of biowarfare, and *Cavernularia* spp. are no exception. While they do not produce sweeper tentacles of a great length, they do secrete toxic mucus that can be damaging to other corals, notably SPS corals. This is mostly due to secreted mucus becoming stuck on corals because the reduced water flow is not strong enough to remove it. On the other hand, sea pens are very susceptible to damaging nematocysts present on the sweeper tentacles of other species.

To be blunt, sea pens are a great candidate for a species-specific aquarium or niche aquarium due to their specialized needs. They will actually do best in a dedicated, reasonably sized setup.

## TANKMATES

When considering what specimens can be kept with sea pens, there are many important factors to take into account. First is the possibility of the sea pen coming into contact with other corals and their toxins due to the tendency of *Cavernularia* to wander and traverse their aquarium. Water flow that can meet the needs of all species in the aquarium is another; remember the importance of

low water flow. Corals that like aggressive currents likely will not do well with sea pens and vice versa. Sea pens may also fall prey to some motile species that are sometimes kept in aquariums. And like all corals, sea pens do not appreciate high levels of nitrogenous wastes, so do not keep them with predatory fish like groupers, lionfish, eels, or the like.

Potential tankmates to be kept in the same aquarium are, of course, contingent upon the size of the aquarium, proximity, decorative layout, and water movement. In larger aquariums, rock and *Caulerpa* barriers can be cleverly integrated into the aquarium so the needs of both parties can be met. All it takes is some careful planning and research.

In general, sea pens should be kept with other octocorals like gorgonians, sea whips and fans, star polyps, and *Xenia* spp. They will also do very well with zooanthids, all types of mushrooms, and *Ricordea* polyps. In most cases, avoid keeping them with LPS and SPS corals.



Steven Maltby/Shutterstock

■ The quill-like appearance of sea pens is largely owed to the arrangement of their feeding polyps.

When choosing motile invertebrates, care must be taken to ensure that a predatory species is not introduced into the sea pen's aquarium, and, when deciding to purchase a sea pen, be certain there are no predatory species already in the prospective aquarium that the sea pen will be acclimated to. Sea pens' primary predators are the red star, the leather star, and a handful of nudibranchs. These are documented to prey on sea pens, and some of them feed exclusively on sea pens. If a species' predatory tendencies are questionable, keep them oceans apart. Don't worry, the most popular members of the cleanup crew are safe for sea pens. These include, but are not limited to, brittle starfish, serpent starfish, sand-sifting starfish, turbo snails, *Astraea* snails, sand-sifting snails, peppermint shrimp, cleaner shrimp, fire shrimp, sexy shrimp, pom pom crabs, blue leg hermits, and scarlet hermits. Do some homework first to determine whether a potential purchase may be a danger.

There are many species of fish that make ideal tankmates for sea pens and other corals. Gobies, blennies, tilefish, seahorses, pipefish, small clownfish, and Banggai and pajama cardinals are excellent choices.

Some types of butterflyfish and angelfish do well with corals. A small shoal of pyramid butterflyfish, which can make a stunning addition to any reef tank, would do great in a calm, tranquil

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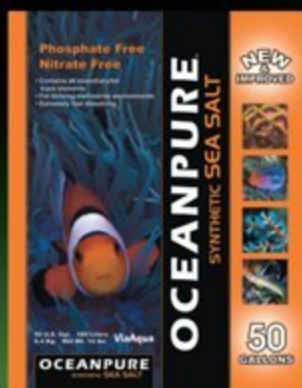
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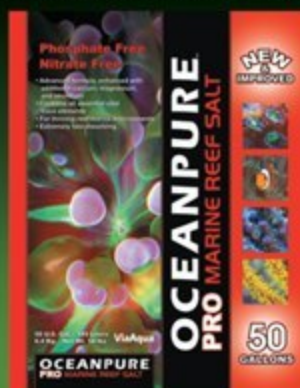
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James Fetherree

■ Like some other corals, sea pens can be extremely long lived.

aquarium such as one that is required for sea pens. Several species of dwarf angels, like flame angels, multicolors, African flamebacks, and lemon peels, to name a few from a long list, would brighten up a reef tank too. They can be territorial among themselves, however, so have a large aquarium if you plan to keep more than one of any one species and/or provide extra visual barriers to break up territories.

It is important to note that dwarf angels are believed to eat corals, but this is a misconception. When people observe them “eating” corals, they are actually feeding on either microalgae or nibbling on mucus. These are not big factors when it comes to sea pens in particular, but keep an eye out to make sure the angel isn’t annoying the sea pen.

### A FEW SPECIES TO AVOID

Many fish are not suitable to be kept alongside sea pens and other corals. Many butterflyfish and angelfish will either nip at or eat corals. Puffers and triggers should be avoided for the same reason, not to mention they produce copious amounts of nitrogenous wastes that would be detrimental to the health of the coral.

Architects and engineers should be avoided for the reason their name implies—they remodel! Many types of wrasses are known to flip rocks and corals several times their size in their daily forages for food. The engineer goby is well known to dig deep burrows and dens, oftentimes causing the rock structure above to crumble and collapse. Rock and most hard corals can be glued in place, but solitary corals like sea pens, brain corals, and plate corals cannot be glued in place and will be at the mercy of the wrasses. If there are burrowing fish, be sure to place rock and structure directly on the aquarium bottom, not on the substrate. This way, as the fish digs, it cannot undermine any supporting substrate. If accommodating their behavior is not possible, simply avoid them.

### Reproduction

Propagation of this mysterious denizen of the deep is unheard of outside of natural occurrences in the wild. This may be largely attributed to their weak demand and low numbers residing in

aquariums. With an increase in popularity, captive spawning procedures could be developed and perfected.

Most sea pens, including *C. obesa*, reproduce by coordinating a release of sperm and eggs into the water column, resulting in the fertilization of eggs in open water. This may occur seasonally or throughout the year. Polyps are either male or female, and both are capable of producing gametes for sexual reproduction. Fertilized gametes develop into larvae called planulae, which drift freely for about a week. Before settling on the substrate, they feed heavily and rapidly develop.

There are a few species where only the males free-spawn, releasing sperm into the water column while the females retain their eggs. As the siphonozooid polyps circulate water through the colony, any sperm that may be in the water gets delivered to the eggs, allowing fertilization to occur internally. The females of these species brood the developing embryos until they have reached an advanced larval stage, at which point the larvae are released into the water. The young sea pens are briefly planktonic and only swim/drift for a few days, during which time they are searching for an ideal location to settle.

Regardless of how fertilization occurs, after larvae settle, they metamorphose into a polyp that ultimately will be the peduncle and rachis, from which the gastrozoid and siphonozooid polyps in the colony arise.

From a reproductive viewpoint, the sea pens that brood their young (*C. obesa* doesn’t) may be the easiest to reproduce in an aquarium. Species that develop in the open ocean will certainly provide many challenges before they are bred in captivity. It is worth restating there are no known documentations of breeding or rearing events in captivity, though there is a first for everything! A few requirements necessary to achieve this goal would likely be a large species-specific aquarium, refugium filtration, carbon filtration, and a reduction of protein skimming. The refugium will aid in natural filtration, increase natural amounts of drifting plankton, and provide bedding sites for planulae. Reducing the protein skimming will aid in preventing the removal of larvae. Having a refugium in line with the aquarium, installed before the protein skimmer, may be a life saver (literally) for larvae, as protein skimmers don’t discriminate between toxic wastes and microbial-life-like larvae.

Considering the near microscopic size of the free-drifting gametes and young developing polyps, it would be wise to have a selection of appropriately sized food readily available and in copious quantities. Phytoplankton and various ciliates would be appropriate choices of food for such small mouths. Food could be maintained in good supply via a drip method, similar to that of a kalkwasser drip. Just be sure not to pollute the aquarium’s water.

### Sea Pens for Advanced Aquarists

Sea pens are magnificent corals. With a good knowledge base and the meeting of proper requirements, it is possible that a correctly cared for sea pen may need to be written into the aquarist’s will. Evidence suggests, based on the analysis of rachis growth rings and fossil records, that sea pens are capable of living for 100 years or more! As more people learn about this unique coral, it’s only a matter of time before sea pens write themselves into popular reef literature. 🐙

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# Behind the Brand: Aquatop



**B**reaking into the aquatic industry just one year ago, Aquatop Aquatic Supplies has gone from being a tiny business run in a garage to a company that is growing rapidly. They offer an assortment of products that range from lights to skimmers, filters, pumps, and more. According to Aquatop's owner and founder, Dave Chai, "Our goal is to inject energy and enthusiasm back to the aquatic industry."



■ Dave Chai (right), owner and founder of Aquatop, with Product Specialist Alex Phelps (left).

## Filling a Gap

Dave, who owns a well-established audio company, has been an aquarium hobbyist for many years. He enjoys playing around with aquarium equipment and would attend aquarium shows in Europe and Asia during his travels. Dave explained that he would see new and innovative products abroad that he could not find in the US, so he decided to start a company that would offer those items. He felt that by offering those new products at "very attractive, factory-direct pricing," excitement would come back to the aquarium industry.

The first product offered by Aquatop was a canister filter with a UV bulb built in. "Customers say that they're so quiet, they always have to put their hands on the unit to make sure it's on. And it's very effective; the UV keeps the water clean," Dave said. "The goal is to bring the products with technology that save people time and are energy saving. I'm not saying people don't want to clean



■ One of Aquatop's more recent efforts is a lineup of nano tank products.

their tanks, but they can take a longer time before they clean up the tanks," he added.

Since then, Aquatop has introduced a variety of other products, including more products using UV technology. Product Specialist Alex Phelps mentioned that they have a "hang-on-the-back filter that has a self-adjusting surface skimmer with a built-in UV sterilizer. I've never seen that in America." They also launched dual-display digital heaters, which show the current temperature of the tank and the target temperature.

## Looking Ahead

Alex says that, moving forward, one of Aquatop's focuses will be on planted-tank equipment. "We kind of see that the East is coming to the West very quickly with the planted-tank movement, with frameless aquariums, and we're trying to

be one of the first companies in the States to offer these tanks at reasonable rates to hobbyists," Alex said.

To that end, Aquatop plans to offer high-quality glass aquariums and curved-corner glass aquariums that will have a seamless bend on the front right and left corners. They are also working on designing and ultimately launching LED lights that have been shown to support photosynthetic life. Given the success



■ Aquatop sells a variety of products ranging from lights to filters.

Aquatop has seen with UV technology, they plan to introduce more products incorporating it.

Another segment of the hobby that Aquatop plans to offer products for is nano tanks. Dave said that "after the economy slowed down, a lot of people couldn't afford the big tanks and the associated products, so they're going small. They still want entertainment, but they want smaller tanks; smaller costs them less, which allows them to stay in the hobby. We want to bring a smaller aquarium to the industry but still give people the same experience and the same enjoyment of watching beautiful fish in the tanks." 🐟

Photographs courtesy of Aquatop.

For more information on Aquatop, please visit [www.aquatop.com](http://www.aquatop.com).

*"Behind the Brand" is presented for purely informational purposes and does not constitute an endorsement of any brand or products by Tropical Fish Hobbyist Magazine. All interviews are edited for length and content.*



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# meeting place

## events

### March 31–April 1 • Costa Mesa, California

The Marine Aquarium Expo (MAX), the largest event for the marine aquarium hobby in North America, will be held at the OC Fair & Event Center in Costa Mesa, CA. Join saltwater enthusiasts from all over the country for a spectacular weekend of selling, trading, exhibiting, and showcasing the latest products in the aquatics industry. The event will include over 100 booths, and every paying adult will get a free MAX swag bag and copy of TFH Magazine. For more information, visit [www.marineaquariumexpo.com](http://www.marineaquariumexpo.com).

### April 26–29 • Fort Lauderdale, Florida

The American Livebearer Association's 2012 convention will be held at the Hilton Airport Hotel in Fort Lauderdale, Florida. The event will feature expert speakers including Dr. Roy Levine, Dr. Rebeca Rueda, and Chuck Davis; an aquarium plant and fish farm tour; a 21-class livebearer show; giant fish and dry goods auctions; and much more. For more information, visit <http://www.ala2012.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. Loisel 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](http://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](http://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](http://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](http://www.theangelfishsociety.org). Membership is \$5 annually, which includes the quarterly FinTastic newsletter.

#### Aquatic Gardener Association

Membership in the Aquatic Gardeners Association (AGA) includes a quarterly journal with informative articles for beginners and advanced hobbyists alike. Dues are \$20 per year (US, Canada, Mexico), \$33 all other countries (multiyear discounts available). For more information see our website, [www.aquatic-gardeners.org](http://www.aquatic-gardeners.org). For a sample copy of The Aquatic Gardener, please send \$6 (US, Canada, Mexico—shipping extra elsewhere) to AGA Bookstore, 2303 Mt. Sinai Road, Chapel Hill, NC 27514, USA.

#### 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](http://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](http://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](http://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](http://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](http://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](http://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](mailto:membership@mackattack.org) or visit [www.mackattack.org](http://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](mailto:members@makc.com) or visit [www.makc.com](http://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](mailto:Contact@MidwestCichlid.com) or visit [www.midwestcichlid.com](http://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](http://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](http://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/](http://www.northeastcouncil.org/nec/)

#### Northwest Killies Club

The Northwest Killies Club (NWK) is an affiliate club of the American Killifish Association. Our intent is to represent the interests of killifish keepers of the Pacific Northwest and beyond. Membership is open to all. Our members are widely scattered, living in various parts of Oregon, Washington, and as far away as Utah. For that reason, we call ourselves

a "virtual club," using e-mail to keep in regular contact and meeting physically only four times a year. We also publish a quarterly newsletter. For more information, visit <http://nwk.aka.org>

#### The Pacific Coast Cichlid Association

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

### ARIZONA

#### Arizona Aquatic Plant Enthusiasts

Meets every third Sunday of the month. See forum for additional details. [www.azaquaticplants.com](http://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](http://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](http://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](http://www.nea-reefkeeping.com)

#### Northwest Arkansas Aquarium Society (NWAAS)

Contact: 479-756-3112 - Meets the second Saturday of each month, 7 p.m., at the Rogers Police Department Community Room in Rogers, AR. General interest club, everyone welcome! <http://nwaas.com>

### CALIFORNIA

#### California Betta Society

Afternoon meetings on the fourth Saturday of each month. Check website for location and contact information. [www.csbettas.org](http://www.csbettas.org)

#### COAST Club

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

#### LA Fish Fanatics

This freshwater fish club meets in the San Fernando Valley, the last Sunday of each month. Contact: 818-370-6930 or email [lafishfanatics@hotmail.com](mailto: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](http://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](http://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.sdmass.com](http://www.sdmass.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](http://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](http://www.sfaquarium.org)

**Silicon Valley Aquarium Society**  
Meets 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](http://www.scrk.org)

## COLORADO

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

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

**Space Coast Reef Club**  
Meets the first Wednesday of each month at 7 p.m. at the Space Coast of Florida. [www.spacecoastreelfclub.com](http://www.spacecoastreelfclub.com)

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

## HAWAII

**The Big Island Aquarium Society**  
Meets the first Friday of every month, the Komohana Agricultural Complex, Hilo, HI, 7 p.m. Contact: Ricky K. Ogata, P.O. Box 6807, Hilo, HI 96720. [kazuor@interpac.net](mailto: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](http://www.honoluluaquariumsociety.org)

## ILLINOIS

**Central Illinois Tropical Aquarium Club**  
Meets the second Sunday of each month. Please visit the centralillinoisitac Yahoo! Group or email [david@davidzink.com](mailto:david@davidzink.com) for more information.

**Champaign Area Fish Exchange**  
Meets on the first Saturday of every month in the Plant Sciences Laboratory, Room 1125, on the University of Illinois campus. Doors at 6:45 p.m., meeting at 7 p.m. [www.champaignfish.com](http://www.champaignfish.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](http://www.aka.org/chika)

**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](http://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](http://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](http://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 [randhu2@juno.co](mailto:randhu2@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](mailto:indycichlidclub@gmail.com). [www.indycichlidclub.com](http://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](http://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](http://www.greateriowareefsociety.org)

**Iowa Aquaria Association**  
Meets quarterly, the first Saturday of February, May, August, and November. [www.iowa-aquaria.com](http://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](http://www.wichitaaquariumclub.com)

## KENTUCKY

**Louisville Marine Aquarium Society**  
Meetings usually the third Sunday evening of the month. [www.LMAS.org](http://www.LMAS.org)

## LOUISIANA

**Southeast Louisiana Aquarium Society**  
Check our website for meeting times and locations. [www.selas.us](http://www.selas.us)

## MARYLAND

**The Capital Cichlid Association**  
Meetings the second Saturday of every month, 2 to 4 p.m. [www.capitalcichlids.org](http://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](http://www.bostonaquariumsociety.org)

**New England Fancy Guppy Association**  
Typically meets the third Sunday of the month at 1 p.m. Email [laurasminskins@comcast.net](mailto:laurasminskins@comcast.net) or check the website for more information. [www.newenglandguppies.org](http://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](http://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](http://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](http://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](http://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](http://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](http://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.org](http://www.missouriaquariumsociety.org)

**Saint Louis Area Saltwater Hobbyists**  
See website for meeting dates and time. [www.slashclub.org](http://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](http://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](http://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](http://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](mailto: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](http://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](mailto: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](http://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](http://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](http://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](http://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](http://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](http://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](http://www.liasonline.org)

**Long Island Reef Association**  
Meets the first Friday of the month. See website for location and speaker. [www.longislandreef.org](http://www.longislandreef.org)

**Nassau County Aquarium Society**  
Meets the second Tuesday of the month (except July & August). [www.ncasweb.org](http://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](http://www.raleighaquariumsociety.org)

**Reef Aquarium Society of Charlotte**  
Meets every third Saturday of the month, 2 to 4 p.m. [www.rasoc.org](http://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](mailto: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](http://www.clevelandaquariumsociety.org)

**Columbus Area Fish Enthusiasts (CAFE)**  
Meets bimonthly in Columbus, OH. [www.columbusfishclub.org](http://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](http://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](http://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](http://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](http://www.ohiocichlid.com)

**Stark County Aqua Life Enthusiasts Society**  
Meets the second Sunday of every month, the Perry Grange, 6300 Richville Dr., Massilow, OH, 5:30 to 8:30 p.m. [www.scalesclub.com](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](mailto: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](mailto: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](http://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](http://www.tfsri.net)

## SOUTH CAROLINA

**Palmetto Marine Aquarium Club**  
For meeting times and location, visit [www.palmettomac.com](http://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](http://www.dallasmas.org)

**Dallas-Ft. Worth Marine Aquarium Society**  
Meetings every third Wednesday of the month, around the DFW Metroplex. [www.DFWMAS.com](http://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](http://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](mailto:stevecgg@myghac.org). [www.myghac.org](http://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](http://www.hillcountrycichlidclub.com)

**Houston Aquarium Society**  
Meets the fourth week of the month, varying locations. [www.houstonaquariumsociety.org](http://www.houstonaquariumsociety.org)

**Texas Cichlid Association**  
Meetings the third Saturday evening of each month. [www.flash.net/~tcichlid](http://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](http://www.gslas.com)

**Utah Marine Aquarium Society**  
Meetings held at the Living Planet Aquarium on the third Thursday of every month. [www.utmas.com](http://www.utmas.com)

**Wasatch Marine Aquarium Society**  
Meetings the first Thursday of each month. [www.utahreefs.com](http://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](mailto:jtoddybas@aol.com)

**Tropical Fish Club of Burlington, VT**  
Meets monthly September through June, the second Thursday of the month, the VFW Hall, 176 South Winooski Ave, Burlington, VT. [www.tfcb.org](http://www.tfcb.org)

**Vermont Marine Aquarists**  
Meets quarterly when there is interest. Contact [erik.engstrom@gmail.com](mailto:erik.engstrom@gmail.com) for more information. [www.saltwatervt.org](http://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](http://www.pvas.com)

**Shenandoah Valley Aquarium Club**  
Meetings typically held on the last Sunday of each month from 2 p.m. until 3:30 p.m. Currently meets at the Arbys in Waynesboro, VA. For more information, check **Facebook (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](http://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](http://www.inwas.org)

**Seattle Saltwater Fish Association**  
Meets biweekly in west Seattle, Washington. Contact: Kristine at 206-935-3212 or email [kvillager@gmail.com](mailto: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](http://www.cwas.org)

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

**Madison Area Aquatic Hobbyists**  
Meets monthly on the third Saturday of the month. <http://madisonaquatic hobby.com>

**The Milwaukee Aquarium Society**  
Meets the third Friday of every month (except July and December), Hoffer's Tropic Life Pets, 7323 N. 76th St., Milwaukee, WI. [www.milwaukeeaquariumsociety.com](http://www.milwaukeeaquariumsociety.com)

**Sheboygan Aquatics Society**  
Meets the second Wednesday of each month. For more information, visit [www.sheboyganaquaticssociety.org](http://www.sheboyganaquaticssociety.org).

## AUSTRALIA

**Australia New Guinea Fishes Association**  
Contact: [membership@angfa.org.au](mailto:membership@angfa.org.au), PO Box 673, Ringwood Vic 3134, Australia. [www.angfa.org.au](http://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](http://www.asw.ca)

**Association Regionale des Aquariophiles de Quebec**  
Meets 7:30 p.m. on the second Monday of every month at 2125 Louis-Joliet, Quebec, QC. [www.araq.org](http://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](http://www.brantaquariumsociety.ca)

#### Calgary Aquarium Society

Meets the second Tuesday of each month. Visit the website for time and location. [www.calgaryaquariumsociety.com](http://www.calgaryaquariumsociety.com)

#### Canadian Killifish Association

Meets monthly, the second Sunday, 1 p.m. Location changes month to month. [www.cka.org](http://www.cka.org)

#### The Canadian Rift Lake Cichlid Association

Quarterly meetings, the University of Guelph, Arboretum Nature Centre in Guelph, Ontario. [www.crlca.com](http://www.crlca.com)

#### Durham Region Aquarium Society

Monthly meetings, the second Tuesday of each month, 7:30 p.m., the cafeteria of F. J. Dovevan Collegiate, 250 Harmony Rd. South, Oshawa, Ontario. [www.drass.ca](http://www.drass.ca)

#### East Coast Aquarium Society

Based in Halifax, Nova Scotia. Monthly meetings from September to June. [www.EastCoastAquariumSociety.ca](http://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](http://www.hdas.ca)

#### Kitchener Waterloo Aquarium Society

Meets the first Tuesday of every month (except July and August). [www.kwas.ca](http://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](http://www.londonaquariasociety.com)

#### Montreal Aquarium Society

Meets the second Wednesday of each month, except in July and August. [www.montrealaquariumsociety.com](http://www.montrealaquariumsociety.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.ovass.ca](http://www.ovass.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](http://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](http://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](http://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](http://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](http://www.aquasam.qc.ca)

#### Toronto Willowdale Aquarium Society (TWAS)

Serving the megacity of Toronto. For more information, email us at [info@torontoaquarium.org](mailto:info@torontoaquarium.org) or visit [www.torontoaquarium.org](http://www.torontoaquarium.org)

#### Vancouver Aquatic Hobbyist Society

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

#### Wet Coast Aquarium Society

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

### INDIA

#### Indian Aquarium Hobbyist Portal

Dedicated to aquarists of India, bringing them together, addressing lack of specific information in the hobby and providing useful resources. [www.iah.in](http://www.iah.in) or [www.indianaquariumhobbyist.com](http://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](http://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](mailto:info@carac.com.mx) for additional information or visit [www.carac.com.mx](http://www.carac.com.mx)

### PUERTO RICO

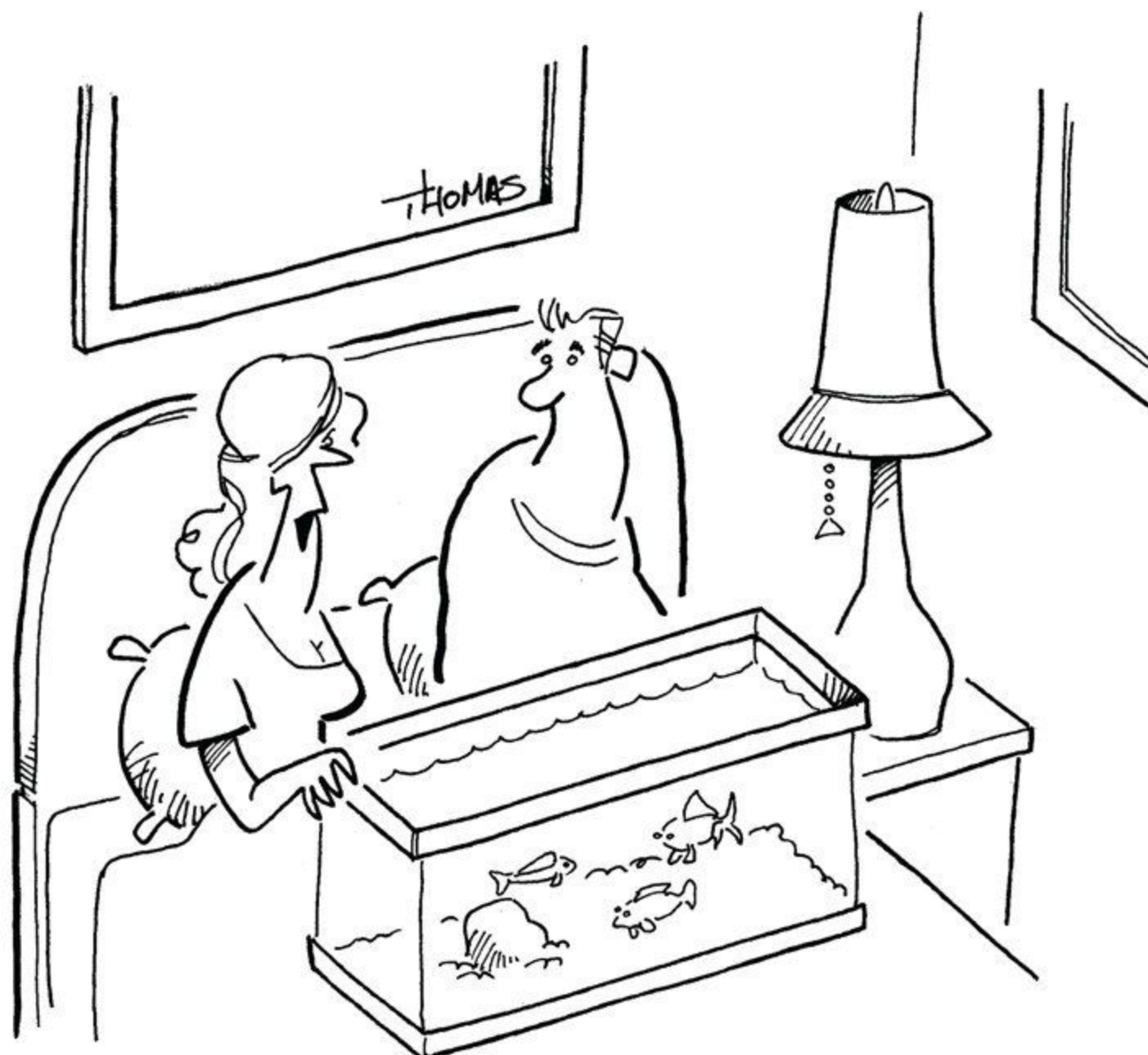
#### Aquarists Metro East of Puerto Rico

Meets in San Juan, every first Saturday, 1:30 p.m., Interamerican University Metro, 426. [www.amepr.org](http://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](mailto:camatos99@yahoo.com) [www.aaapr.org](http://www.aaapr.org)

If your club would like to be included in "Meeting Place," please contact Tsing Mui at [tmui@tfh.com](mailto:tmui@tfh.com)



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# Product Spotlight



## CO<sub>2</sub> Regulator Kit

**American Marine Inc.** introduces the CO<sub>2</sub> Regulator Kit, a high-end regulator/solenoid engineered specifically for the aquarium hobby at an affordable price. The kit will fit standard or paintball CO<sub>2</sub> bottles (with an optional adapter) and includes a regulator with an electronic non-stick solenoid, an LED indicator light, glass bubble counter, precision-adjustable micro-needle valve, output pressure gauge, 20 feet of silicone tubing, an extra replacement gasket kit, AC adapter, adjustment screwdriver, and 12-month warranty. This is an excellent regulator/solenoid for any hobbyist who is automating a calcium reactor or setting up a freshwater planted aquarium. For more information, visit [www.americanmarineusa.com](http://www.americanmarineusa.com).

## LED Light and Airstone

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Attn: Tsing Mui • Email: [tmui@tfh.com](mailto: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...

## livebearer showcase

Livebearers are some of the most common and popular fish available, and members of the American Livebearer Association gather every year to discuss them. Whether you're into creating a beautiful setup for wild swordtails, want to learn more about the different types of fancy mollies, or want to preserve a goodeid species, the May 2012 issue is sure to have something that suits your livebearer tastes.



Andrzej Zabawski

## choosing marines

So your first saltwater tank is set up, cycled, and just begging for fish to be added. Now you're probably asking yourself, "What fish should I pick?" The selection can be daunting, and conflicting advice can make the task of choosing your first saltwater animals an impossible one. An expert reefer relates his top five fish for the marine tank to help ease the decision.



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## is there a doctor in the tank?

The famous, or infamous, doctor fishes of Myanmar have made a splash at nail salons around the world. Even if you disagree with their use as providers of pedicures, doctor fish of the genus *Garra* make fantastic additions to aquariums. Their fascinating looks, peaceful natures, and algae-eating habits will make you want to bring one home!



Stan Sung

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

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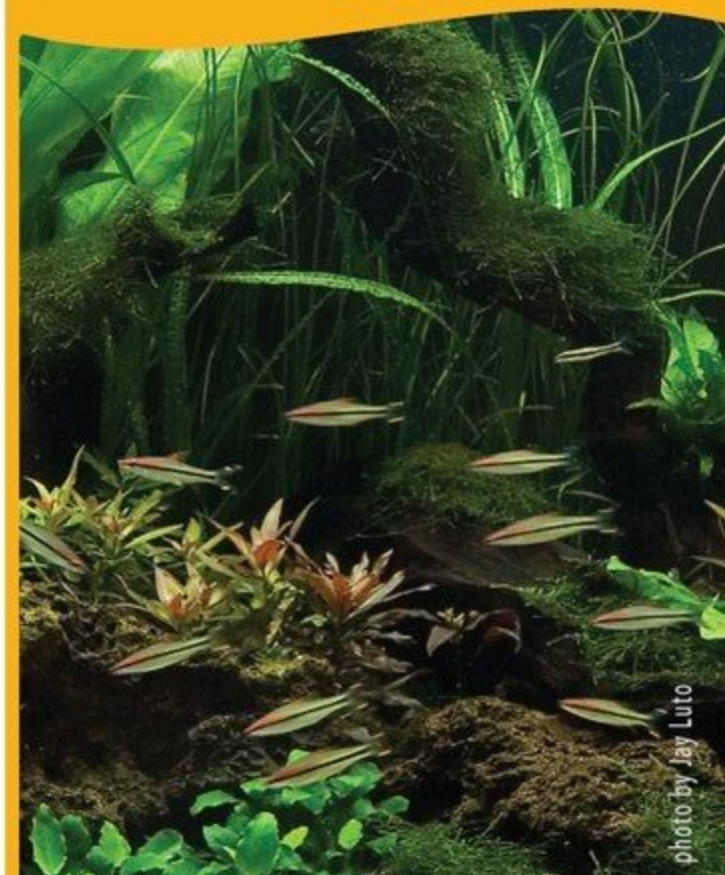


photo by Jay Luto

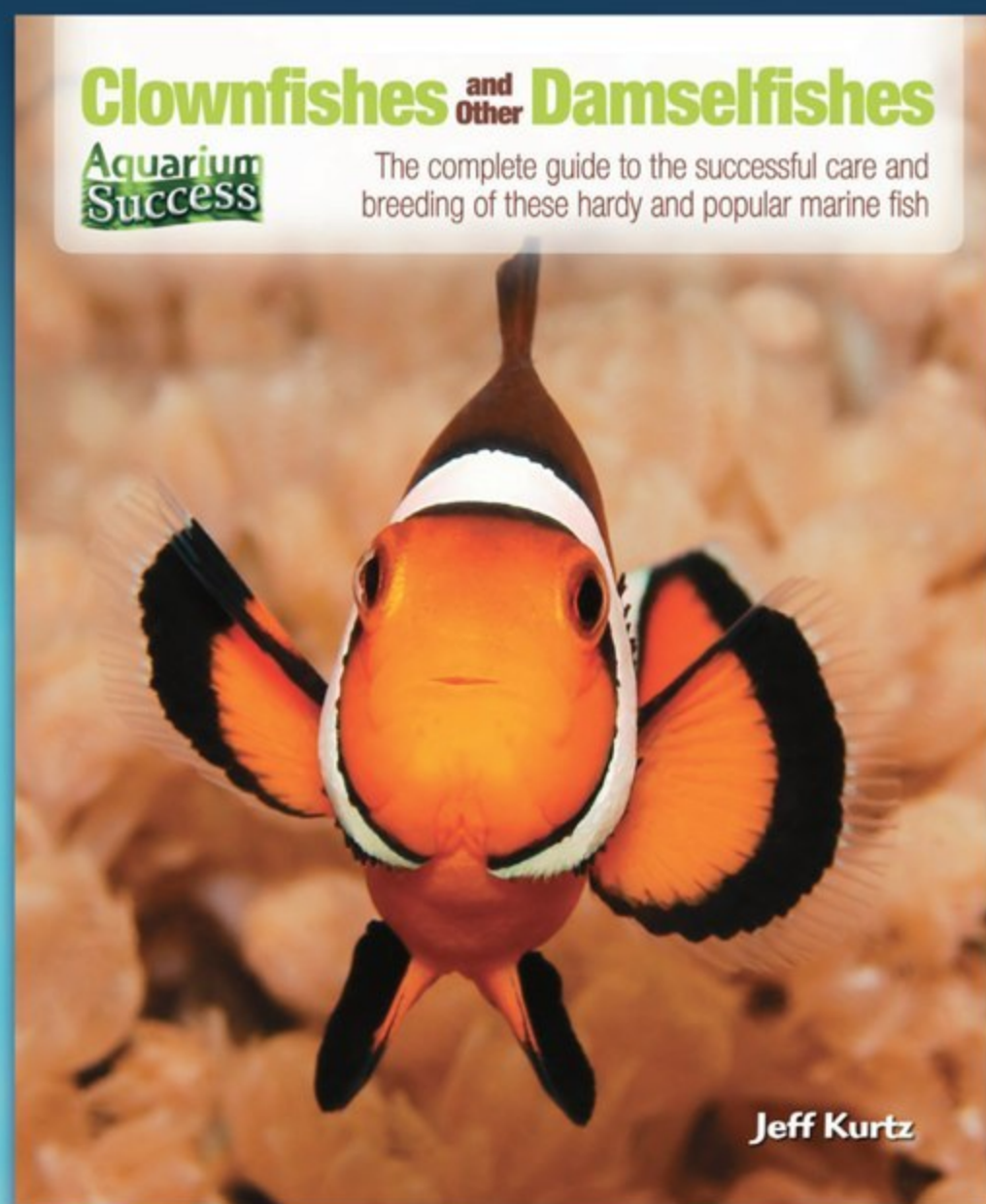
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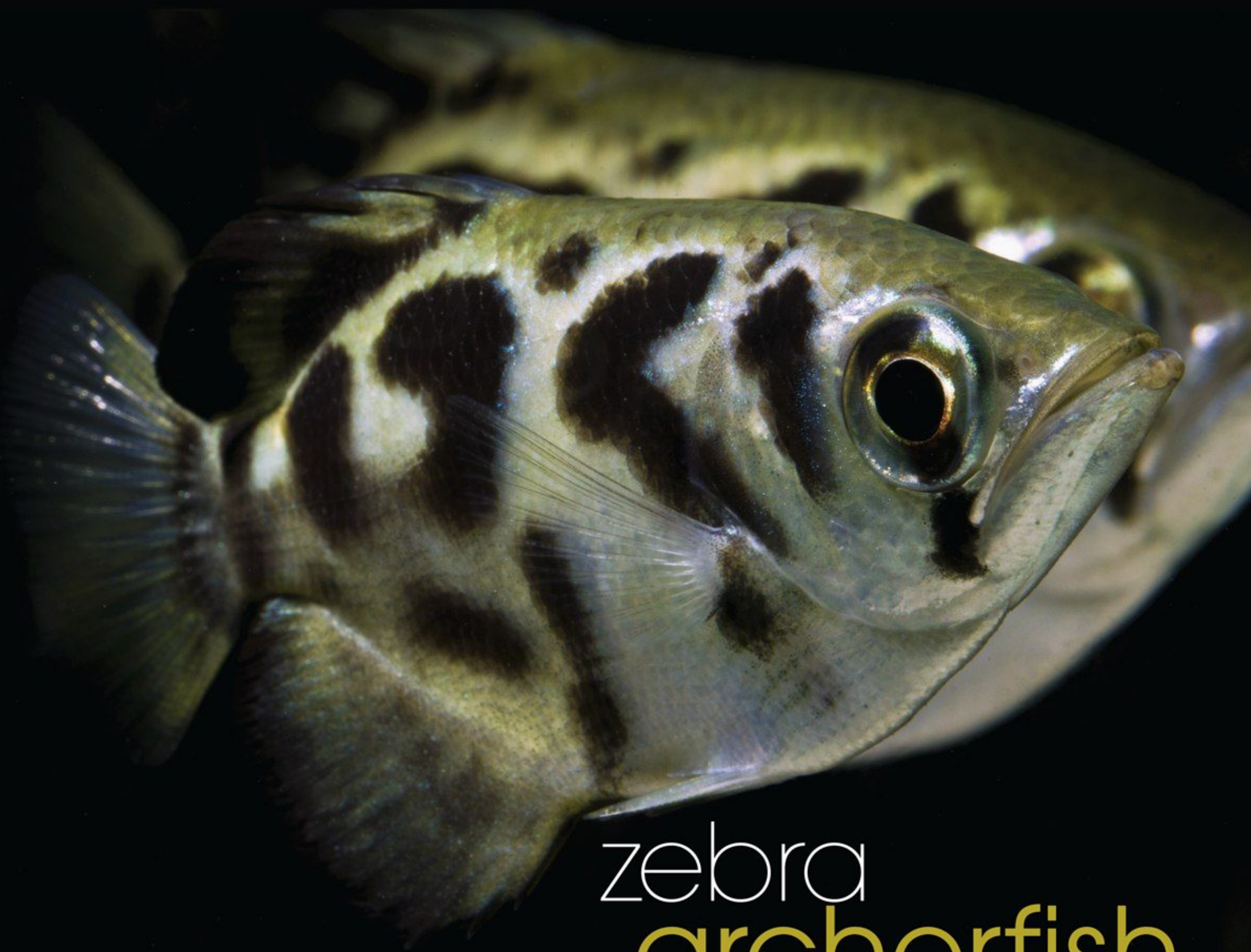
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# PARTING SHOT

Photo: Leighton Lum



## zebra archerfish

*Toxotes blythii*

**A** relatively uncommon species in the trade, the zebra archerfish (*Toxotes blythii*) exhibits all of the desired archerfish behavior but is considerably easier to keep because it does not require brackish water. Coming from freshwater rivers and tributaries in Burma, it requires fresh, well-oxygenated water with a swift current in the aquarium.

If you are looking to create a striking display with these fish, put a group of four or preferably more in a large paludarium. If you can't keep a group of four, then get only one to prevent excessive aggression between a few individuals. When provided with live insects, they will live up to their common name and spit a stream of water at their prey, knocking it into the water before consuming it. Be sure to put a tight cover on the tank, though, as archerfish are known to leap large distances.

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