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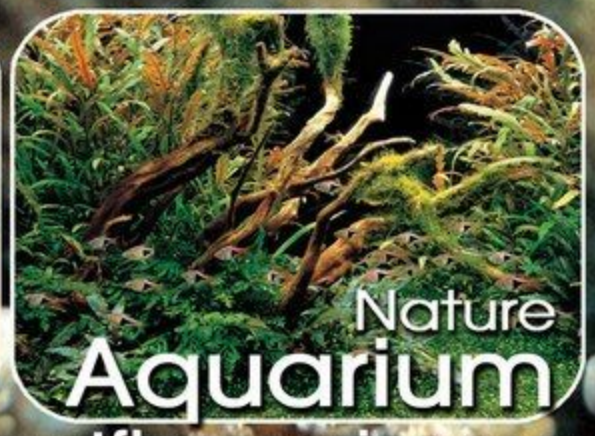

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cover

In the huge water volume of their native reef habitats, the school of blue-green chromis on our cover rely on relatively stable conditions, chief among them a comfortable temperature range. One of the most important things to know in maintaining a saltwater aquarium is how to keep the water at the correct temperature for all the organisms to thrive. In a reef aquarium especially, having all of that equipment running simultaneously can make keeping a specific temperature very difficult. However, as reefkeeping expert Phil Hunt explains this month (p. 78), there are plenty of things you can do to keep things cool for your tank's precious inhabitants.
Photograph by Levent Konuk/Shutterstock

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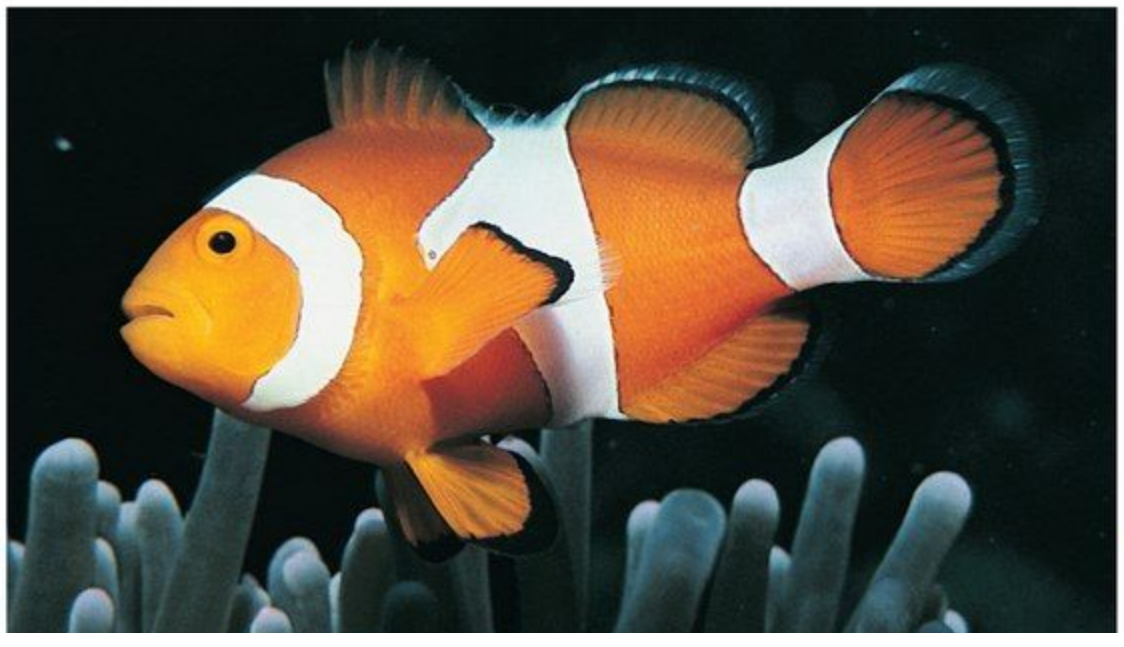

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editor-in-chief: Albert Connelly, Jr.

Editorial & Design

senior consulting editor: Jeff Kurtz

managing editor: Shari Horowitz

art director: Alexander Appello

editors emeritus: Warren E. Burgess, PhD, Neal Pronek

contributing editors: James Fatherree, MSc, Bob Fenner, Richard Stratton, Jack Wattley, Amanda Wenger, Claudia Dickinson, Mark Denaro, Charles Clapsaddle

Advertising

advertising sales manager: Sandra Rivera
advertising@tfh.com

Subscriptions

customersupport@tfh.com
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editor's note


Blake Tedeschi

A fantastic aspect of the marine aquarium hobby is the abundance of options—almost limitless combinations of fish and invertebrates can be grouped together in a saltwater aquarium. However, not all livestock combinations are compatible. The key is to always make informed stocking choices so the inhabitants will coexist peacefully, and you will be happy, for years to come.

Some of the easier fish choices for beginners and advanced hobbyists alike can be found among the clownfishes. There are numerous clownfish species, ranging from small and peaceful to large and aggressive. They come in a variety of colors, from the classic orange and white to red, pink, and even black. You can also use some species as an easy entry into marine fish breeding and then graduate to some more challenging ones as you become a more proficient breeder. Our exclusive book excerpt of Joyce Wilkerson's classic *Clownfishes: A Guide to Their Captive Care, Breeding, and Natural History* (now available as an e-book from TFH Publications) provides an overview of the many clowns that are available (p. 70).

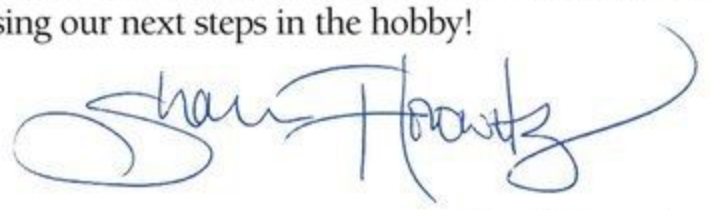
Now, selecting fish is one thing, but in the marine hobby the main focus is often on corals. Choosing compatible corals for a large reef system is hard enough, but choosing ones that can get along in a smaller space can be exceptionally difficult. This month professional reef aquarist Bob Fenner offers invaluable tips on how to identify corals that won't wage war in your nano reef, and how to introduce them to each other to keep the peace (p. 36).

And speaking of animals that can be difficult to keep properly, there are some fish commonly available in the marine trade that should be kept only by experienced aquarists who are prepared to meet their needs. The copperband butterfly is such a fish, even though it winds up in beginner aquariums all too often. An expert reefkeeper reviews how to choose the right specimen of copperband, with advice on keeping one healthy in your aquarium if you're up to the challenge (p. 84).

Finally, a different type of choice you may have to make is whether or not to remove an unexpected organism you've discovered in your tank. Hitchhikers of all kinds can come into marine aquariums on live rock and coral, and while some are undesirable, others can be good for the tank. Coral crabs, for example, often suffer from the assumption that they will harm inverts, but many of them perform a beneficial service, as explained by our resident reef columnist (p. 40).

All this is not to say that the freshwater side of the hobby suffers from any dearth of choices. This issue covers everything from creating unbelievable planted tanks (p. 46) to breeding exotic species such as threadfin rainbowfish (p. 52) to training your fish to interact with you on a personal level (p. 62).

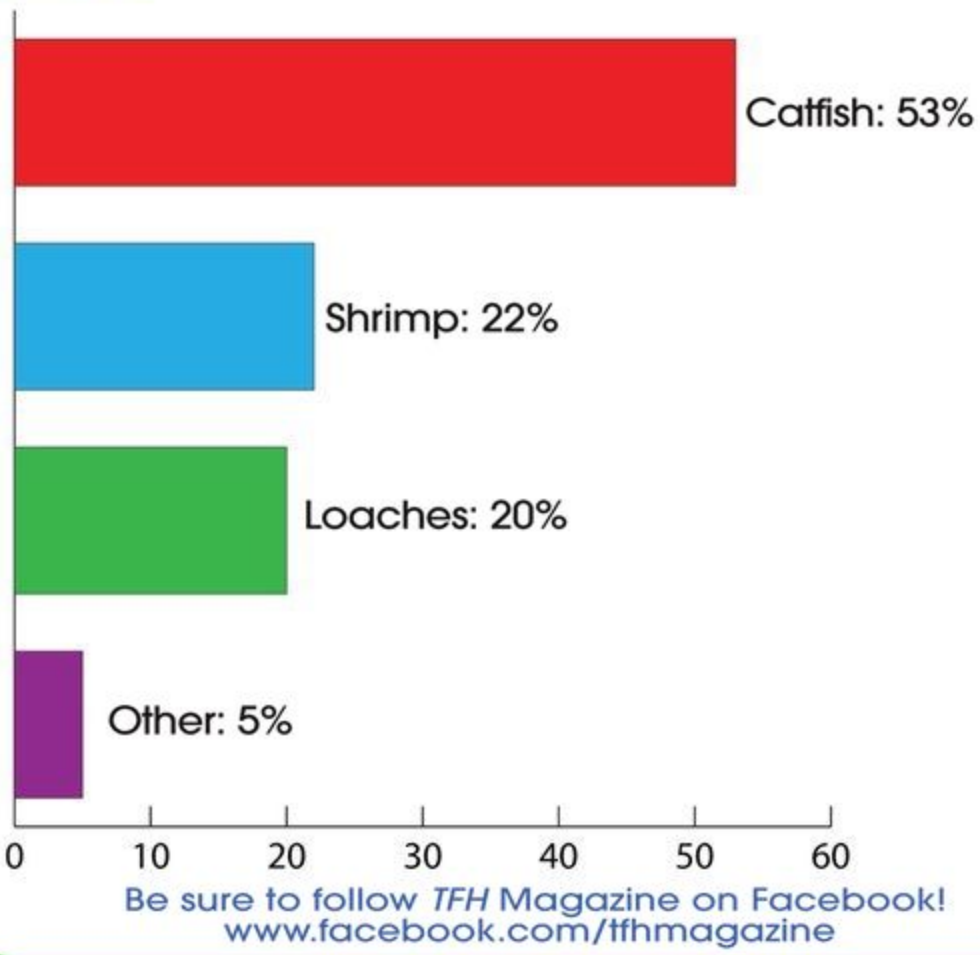
Whether you want to create a spectacular setup, find the perfect fish, or simply maintain a happy and healthy aquarium, *TFH* is here to help. And with that, let's start choosing our next steps in the hobby!



Shari Horowitz
Managing Editor
Tropical Fish Hobbyist

readers' forum

TFH Facebook Poll
What is your favorite bottom dweller?



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In the July 2013 issue, Richard Stratton listed his favorite community-tank cichlids in "Cichlids for the Community Aquarium." We asked you what your favorite community cichlids are.

Bolivian ram cichlids do well for me in community setups.
Calvin Rickey

I have had convicts with silver dollars, angelfish, and various tetras with no problems. The convicts and angelfish bred successfully many times also. Imagine that, convicts breeding easily (lol).
Adam Poage

Neolamprologus leleupi have always done well in community aquariums for me. I currently have five *leleupi* in with five clown loaches, three giant danios, and seven platies. In another tank, I have several red-spot gold severums, very peaceful.
Bill Abate

German blue rams have worked out fantastically in my community tank! I had angels in with Harleys for about a year and a half, then the angels matured and started to dart at the Harleys, but the rams definitely worked out!
Holly Middleton

Mesonauta festivus! I love them. Very underappreciated relative and fellow resident of the same natural habitat as angels.
Lawrence Morello

Rainbow cichlids (*Archocentrus multispinosus*) have been working out well for a couple of years now. They only get testy with the San Juan corys occasionally (nothing more than a short dart) and never pay any attention to the tetras (pristella/black neon). *Cleithracara* and *Laetacara* work great too.
Tony Cox

To send a question or comment to "Readers' Forum," email letters@tfh.com. All letters sent to *TFH* may be edited and published at the discretion of the editors and publisher; due to the volume of mail we receive, we are unable to respond personally to all communications, but every message is read.

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Huai Mae Khamin Waterfall

One of the most popular places in Kanchanaburi, Thailand is the Huai Mae Khamin Waterfall. Located in Sri Nakarin National Park, this seven-tiered waterfall is accessible both by a foot train and trekking through the forests and bamboo groves.

Stocked with beautiful orange and gold koi, this is the ultimate pond-lover's dream. As is the case with the smaller waterfalls often built into garden ponds, the falling and churning action aerates the water and provides the ultimate surface for biological filtration—inspiration you might want to use for your own pond!

Patrick Foto/Shutterstock

Q&A freshwater

Q Who's Nibbling My Plants?

I have a 40-gallon freshwater aquarium dedicated to South American tetras. The tank houses schools (six each) of three different species: bleeding heart tetras, red phantom tetras, and Buenos Aires tetras. I also have live plants around the periphery of the tank that are getting eaten. I don't have many snails in the tank, so I assume the fish must be doing it, but I haven't caught anyone in the act. Any idea who's nibbling my plants and how I can put a stop to it?

Abe Lapin
via email

A *I'd say the culprits are almost assuredly your Buenos Aires tetras* (Hyphessobrycon anisitsi), *as this species is notorious for its plant-eating propensity. Since these tetras are plant nibblers by nature, there's not much you can do to stop this behavior completely. However, as soft-leaved plants are especially vulnerable to their nibbling, one thing you might try is working more tough-leaved plants, such as Java fern or* Anubias *species, into your aquascape. You could also try to distract them from your live plants by regularly offering veggies just for them to munch on, such as zucchini, lettuce, spinach, or even sushi nori—though offering these items is no guarantee they'll leave your plants alone. If all else fails, you can always switch to artificial plants.*

Q Fuzzy Substrate

In several areas of my aquarium, the gravel is developing a white, fuzzy, cottony coating. Can you tell me what this is and what I can do to get rid of it? The tank is 30 gallons and has been set up for about two months. I have seven tiger barbs in it.

Faith Cholewinski
via email

A *The white, fuzzy material you describe sounds like fungus growing on decomposing organic matter to me. This typically develops in systems that are overfed, overstocked, inadequately filtered, or seldom vacuumed (or some combination of these factors) so there's a lot of uneaten food and fish waste left lying around on the substrate. I don't think your tank is overstocked, so the solution to your problem might be a simple matter of assessing the amount you're feeding and cutting back if necessary as well as stepping up your water-change/gravel-vacuuming regimen to eliminate the buildup of detritus in your substrate. You should also assess whether your mechanical filter is doing a sufficient job and whether the water circulation in the system is adequate to keep debris in suspension long enough for the filter to actually capture it.*

got a question?

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

Q Kissing Gourami Questions

I have a pink kissing gourami in my 30-gallon aquarium, and I hope you can answer a few questions about it for me so I can be sure I'm giving it the care it needs. First, I've been feeding it just flakes, and it seems to be doing alright on that. Should I be giving it something else in addition? Second, how can I confirm whether it's a male or female? I've never seen it build a bubblenest, which I know gouramis do, so I'm guessing it's probably a female. Third, I know a 30-gallon tank won't hold my kisser for long, so how big a tank should I be saving for?

Christiana Keller
via email

A First let me say I'm glad you're aware that your 30-gallon won't hold your kissing gourami (Helostoma temminkii) *for long. In fact, it will outgrow that tank rapidly and can ultimately reach about a foot in length. If you happen to keep back issues of* TFH, *you might want to pull out the April 2012 issue, which contains an excellent article about kissing gouramis written by regular* TFH *contributor Mark Denaro. In it, he emphasizes that 75 gallons is a bare-minimum tank size, adding, "A much better tank would be one that is 24 inches front to back and as long as possible."*

With respect to feeding, H. temminkii *is an omnivore whose natural menu consists of a variety of plant- and animal-based items, including, according to FishBase.org, green algae, zooplankton, and aquatic insects. Flakes are fine as a staple item for small specimens, but Denaro recommends switching to appropriately sized herbivore and carnivore pellets as specimens grow as well as offering a wide variety of frozen foods.*

The absence of bubblenest-building behavior isn't actually a clue to the gender of your specimen, as H. temminkii *is an egg-scattering species, not a bubblenest builder or mouthbrooder. In fact, as Denaro writes, "Differentiating the sexes is extremely difficult and only possible visually when the female's abdomen starts to fill with roe."*

Aquariumphoto.dk

■ Buenos Aires tetras (*Hyphessobrycon anisitsi*) are known plant eaters and should be kept only with tough-leaved or artificial plants.

Aquariumphoto.dk

■ Reaching a length of over one foot, the kissing gourami (*Helostoma temminkii*) should be kept in a tank no smaller than 75 gallons.

Q Betta Takes a Pass on Peas

The dealer who sold me my male betta said that I should feed him a pea every once in a while to prevent constipation. But when I put one in his tank, he shows no interest. Do you suppose the pea is just too big and I need to chop it up beforehand?

Jenny Oberlin
Jackson, Mississippi

A Keep in mind that bettas are not naturally herbivorous, so they won't automatically recognize a pea as something edible. In fact, some never take to eating peas at all. Also, how you prepare the pea before offering it makes a big difference. The usual recommendation is to first blanch the pea by boiling it in water for a few minutes (e.g., in a cup in the microwave). You then peel off the skin or squeeze the soft internal part of the pea out of the skin. Only a small amount of this soft, mushy material is actually offered to the betta at one time. It's also helpful to withhold other foods for a few days before offering the pea so the betta is good and hungry and more apt to try something different.

If you don't have any luck getting your betta to accept blanched peas, you could also try offering him some live or frozen daphnia. These tiny crustaceans, also known as "water fleas," are said to have a similar laxative effect.

Q Glass Catfish Won't Eat

Three days ago, I added a glass catfish (I believe it's *Kryptopterus bicirrhis*) to my 40-gallon community tank, and I haven't seen it eat anything since. I've tried feeding flakes, sinking pellets, and frozen brine shrimp, but it just ignores everything I offer. What can I do to encourage it to eat? All my water parameters are excellent, and my other fish are doing fine.

Mindy Hanford
Overland Park, Kansas

My first suggestion is to add at least five more glass catfish to your tank. Kryptopterus bicirrhis *is a shoaling species that does not thrive when kept singly. If your system can't accommodate the additional bioload, you'll probably need to return the lone specimen to your dealer.*

With respect to feeding, glass catfish tend to orient themselves facing into the current and snatch small prey items that drift through their midst. To encourage this natural behavior, try providing moderate, linear water flow through your tank (e.g., across the front) with a powerhead or filter outlet, and then deliver food upstream of the catfish with a turkey baster so that it drifts right into the shoal. You'll likely have better success eliciting a feeding response with live or frozen meaty items, such as mysid shrimp, bloodworms, or mosquito larvae, rather than dry flakes or pellets.

Q Clown Squeaker Care

Does the clown squeaker require any special care that you're aware of? I'm looking for a neat catfish for my 75-gallon community tank, and I think the clown squeaker might just fit the bill. By the way, where does the "squeaker" part of the name come from?

Kelsey Billmeyer
Houston, Texas

Assuming you're referring to Synodontis decora, *the only special care requirement I might list is a good-sized tank, as this species reaches about a foot in total length. But I think you have that pretty well covered with your 75-gallon. Beyond the consideration of tank size,* S. decora *is not especially demanding with respect to water chemistry. It's also omnivorous and not at all fussy when it comes to feeding. Virtually any standard aquarium fare will be accepted.*

One potential downside to this species is its nocturnal nature and general shyness. You may not see your specimen very often. Be sure to provide lots of hiding places in the form of driftwood tangles, rock caves, etc., and keep the lighting relatively dim. Special moonlighting may facilitate evening viewing opportunities. Over time, and with regular daytime feedings, your clown squeaker may begin to show itself more frequently in the day.

The "squeaker" moniker, which is applied to other members of the Synodontis *genus as well, comes from the ability of these fish to produce squeaking or clicking sounds by grating the pectoral spine against the pectoral girdle.*

Q Is the Peppered Cory Beginner Friendly?

I'm a first-time hobbyist, and I'm looking

for a pretty little bottom dweller for my 20-gallon tank. Would you recommend the peppered cory cat for a novice?

Adam Reinhart
via email

A I'd say the peppered cory (Corydoras paleatus) is just about the perfect species for a beginning hobbyist. Among its many favorable attributes, C. paleatus is very peaceful toward tankmates and thus ideally suited for the peaceful community aquarium. It's also very hardy and adaptable, tolerating a pH anywhere between 6.0 and 8.0 and water that is anywhere from moderately soft to hard.

A good target temperature is anywhere between the low- and upper-70s. Like all cory cats, C. paleatus prefers to be kept in groups of five or more and should be provided a sandy or smooth-edged substrate to prevent specimens from injuring their sensitive barbels (whiskers). This species is also very easy to breed in case that interests you.

Knorre/Shutterstock

■ Being peaceful, hardy, and adaptable, the peppered cory (*Corydoras paleatus*) is an ideal beginner's fish.

Q Do Live Feeders Boost Aggression?

Is it true that offering live feeder goldfish to predators makes them more aggressive toward their tankmates?

Jake Whitacre
via email

A I don't know whether there's any scientific data to prove conclusively that predatory fish become more aggressive toward tankmates specifically because they've been offered live feeders to eat, but there's certainly a lot of anecdotal evidence out there to suggest this might be the case. However, the potential for live goldfish or other feeders to promote aggression in predatory species should be the least of your concerns in offering them.

As I've pointed out on many occasions in this column (though it's a point that bears repeating), the live feeders offered for sale at your local fish store are generally kept in a state of starvation and in abysmally crowded and unhealthy conditions. So not only are they worthless from the standpoint of nutrition, but they can also serve as a channel for all kinds of nasty parasites and pathogens to enter your aquarium and infect your valued specimens.

While it can be fascinating and exciting to watch fish exhibit natural predatory behaviors, the reward is definitely not worth the risks when it comes to offering live feeders.

Q&A saltwater

got a question?

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Q Sassy Sixline Wrasse

Is it normal for a 2-inch sixline wrasse to pick on a 5-inch marine betta, or was I just "lucky" in getting one that's especially bold for its size?

Martha Schultz
Shreveport, Louisiana

A *I'd say that's perfectly normal behavior for a sixline wrasse* (Pseudocheilinus hexataenia). *Given its relatively diminutive size, this species can be surprisingly pesky and aggressive toward more passive tankmates, even those that are quite a bit larger, such as your marine betta (likely* Calloplesiops altivelis*).*

A factor that might bolster P. hexataenia's *boldness is this species' impressive swimming speed and maneuverability. I've had a specimen in my 125-gallon tank for several years, and it seems almost cocky in its ability to evade a pursuer (which it likely irritated to begin with) by disappearing into small holes or crevices in the rockwork and emerging at the opposite side or end of the tank. I've even seen it pull a perfect* Top Gun *"Maverick" maneuver—slamming on the brakes, slipping behind a pursuing tankmate, and then nipping at its tail. Its antics remind me of a squirrel taunting a dog when it knows a high, safe tree branch is close at hand.*

Q Refugium on Reverse Photoperiod

I'm setting up a refugium that will have a deep sand bed in one compartment and *Chaetomorpha* algae in the lights over the chaeto to turn on at night and turn off during the day. Does this recommendation make any sense to you? What is the purpose behind it?

Rod Lowery
via email

A *Yes, reversing the photoperiod (i.e., turning the lights on at night and off during the day) over a refugium containing macroalgae, like your chaeto, does make sense to me and is a relatively common practice. The purpose behind it is to minimize the degree of pH fluctuation in the system between daytime and nighttime. You see, during daylight hours, any algae in the system—in both the refugium and the display tank—are carrying out photosynthesis, a process that utilizes carbon dioxide and releases oxygen. At night, just the opposite occurs, with the algae consuming oxygen and releasing CO_2. The more CO_2 is dissolved in water, the more acidic it becomes, which is why the pH of an aquarium has the tendency to decrease at night. Having your display tank and refugium on a reverse photoperiod will simply help to minimize this nocturnal drop in pH.*

Q Substitute Cleaner

I'd love to keep a bluestreak cleaner wrasse in my saltwater community tank in order to observe its amazing cleaning behavior, but as I understand, this species does very poorly in aquariums. Is there another species of cleaner fish I can substitute that is better suited to aquarium life?

Ramesh Gupta

A *You're absolutely right that the bluestreak cleaner wrasse* (Labroides dimidiatus) *and its congeners make very poor aquarium candidates because they are obligate cleaners that seldom learn to accept alternative foods in captivity. The good news is, among the gobies, in the genus* Elacatinus, *there are numerous species that clean other fish. At least two of these species, the sharknose or cleaner goby* (E. evelynae) *and the neon goby* (E. oceanops), *not only appear regularly in the aquarium trade, but also very closely resemble the bluestreak cleaner wrasse in body shape, color, and patterning. Best of all, they're facultative cleaners, meaning they don't depend exclusively on this behavior to derive their sustenance, so they usually adapt well to substitute foods and aquarium living in general.*

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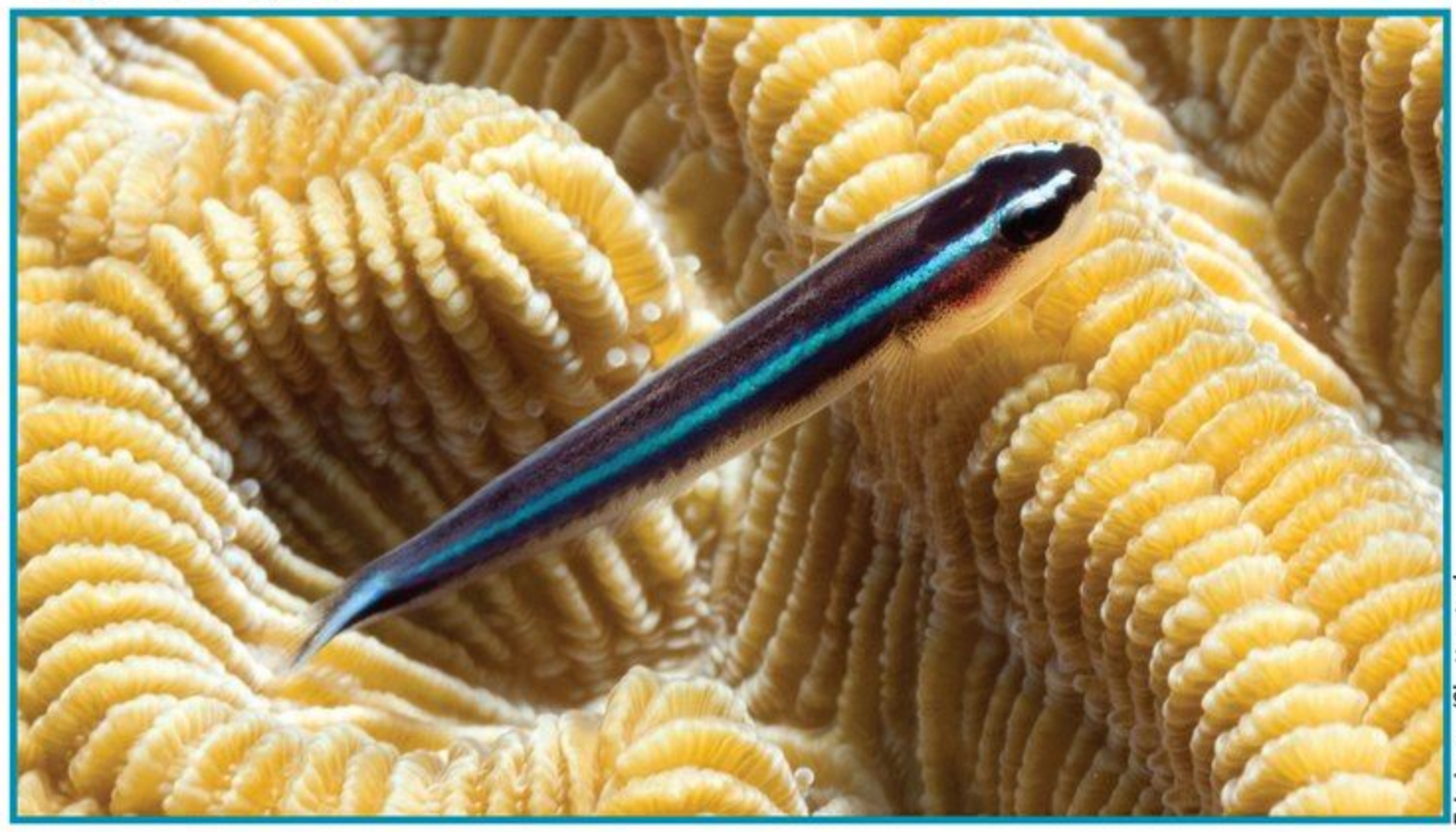
■ Sixline wrasses are fairly aggressive for their size, even towards some species that are much larger than they are.



Eric Lemar/Shutterstock

■ Known to accept a variety of foods, the neon goby (*Elacatinus oceanops*) will also exhibit cleaning behavior in an aquarium.

Q Lighting Option Overload

I'm wondering if you can give me some advice on how to choose the lighting for my 55-gallon reef-tank-in-progress. There are so many options out there that I really don't know where to begin. From what I've seen researching online, there are LEDs, metal halides, T5 fluorescents, power compact fluorescents, standard fluorescents, VHO fluorescents, and different combinations of these styles to choose from. Which kind do you think is the best? Also, I really like the shimmering effect that some lights create. Is one style better than another for that?

Jim Lehman
Windsor, Ontario

A *To get that nice shimmering effect—known as "glimmer lines" or "glitter lines"—you would need to use point-source lighting, such as LEDs or metal halides. You won't get this effect with fluorescent lamps, which emit light along the entire length of the tube. So, that might help you winnow down your options a bit.*

Beyond that, the best recommendation I can give you is to start by determining exactly what specific types of corals or other invertebrates you'd like to keep. Photosynthetic invertebrates vary considerably in their lighting requirements. Some, including many of the so-called mushroom polyps (corallimorphs), prefer relatively subdued lighting. Others, such as Acropora *and* Pocillopora *stony light. Still others fall somewhere in between. There can also be considerable variation in lighting demand among very similar groups of invertebrates or even among congeners. Once you figure out which specific animals you'd like to keep, you can work with a trusted dealer to help match your lighting type and intensity level to the species you've chosen.*

Think of it like this: If you were considering bringing a dog into your home, you wouldn't go out and buy a collar, food dish, carrier, doggie bed, and chew toys and then try to find a breed that fits all these items. You'd decide what type of dog you want first and then go out and purchase appropriately sized items for it. The same concept applies to reef lighting—there's no such thing as one-size-

Q Redspotted Blenny Care

Can you give me any information on how to care for the redspotted blenny? Thanks in advance!

Justin Meredith
via email

A *Assuming the blenny in question is* Blenniella chrysospilos, *you'll want to provide a good-sized system—say 40 gallons or more—that is well established and aquascaped to provide lots of nooks, crannies, and caves, as it likes to hop from rock to rock as well as hide in recesses with only its head emerging.*

B. chrysospilos' *natural diet consists of*

Ethan Daniels/Shutterstock

■ Most Moorish idols (*Zanclus cornutus*) do not survive in captivity, and they should not be purchased for aquariums.

you'll need to offer algae-based foods along with small meaty items, such as frozen mysid shrimp or plankton. Do be aware, however, that this species is sometimes reluctant to accept prepared aquarium foods. There should also be a decent crop of microalgae in the system to support this species' grazing propensity. B. chrysospilos *often fails to thrive in "sterile" newly set up tanks or systems that are meticulously scrubbed clean of algal films.*

B. chrysospilos *isn't overly aggressive toward unrelated species, but it will get its hackles up in the presence of conspecifics, closely related species, and similar-looking/behaving species (e.g., gobies or hawkfishes). The redspotted blenny is generally reef safe, but may nip at fleshy or large-polyped sessile invertebrates.*

Q Friend Succeeding with Moorish Idol

I have a friend who bought a Moorish idol about six months ago, and it seems to be doing well in his 125-gallon aquarium. I asked him what he's doing right, and he said "nothing special." Apparently it eats just about anything he offers. I tried to keep an idol some years ago and it died within a few weeks. We're both pretty competent aquarists, so why did he succeed where I failed?

Kyle Simmons
Columbus, Ohio

A Though the Moorish idol (Zanclus cornutus) is notoriously difficult to sustain in aquaria, the odd specimen will thrive in captivity for one reason or

another—more the "luck of the draw" than any reflection of the hobbyist's skill level. However, such rare exceptions should not be taken as license to buy this sensitive species, as the vast majority of specimens that enter the market are doomed to die very prematurely in hobbyists' tanks.

That brings up an important point to consider: Keeping a marine fish alive for six months can hardly be considered "success" when many species are capable of surviving for decades. That's sort of like an NFL running back spiking the football and doing his end-zone dance on his team's one-yard line. I've seen fish succumb to nutritional deficiencies after many months, and they'll often appear healthy almost right up to the point of dying. So, I wouldn't assume your friend's Moorish idol is "out of the woods" just yet.

Q Avoiding Coral Allelopathy

How can I reduce the risk of having problems with coral chemicals in my reef tank?

Pete Timkin
via email

Stephen Gibson/Shutterstock

Sarcophyton spp. are known to be particularly toxic to other corals.

A

I assume you're referring to allelopathy among corals, or competition through the release of toxic chemical compounds. Minimizing the impact of allelopathy in a reef system takes a multifaceted approach. The first is to stock the tank at the outset with relatively compatible corals. A little research on your part will help you determine which species are likely to coexist peacefully and which are known to be chemical troublemakers.

Generally speaking, your best bet is to avoid creating a mixed reef that includes a "grab bag" selection of both soft and stony corals, as many members of the former group are especially prone to releasing toxic chemicals to compete with members of the latter (though many stony corals produce allelopathic compounds, as well). Instead, strive to limit your focus to either all stonies or all softies. If you do mix species of these two broad categories, you'll do well to avoid the inclusion of notoriously toxic corals, such as Sarcophyton *spp.*

In addition to conscientious stocking, other allies in the prevention of allelopathy problems include providing brisk, turbulent water circulation throughout the system; vigorous protein skimming; the use of activated carbon in the system to adsorb toxic compounds; frequent partial water changes; and the use of ozone.

ask jack

jack wattley

Dear Jack,

I am about to add discus to my tropical fish collection. I would appreciate any information from you as to exactly what I should look for when I purchase discus. We have plenty of good aquarium shops and pet shops in this area, so it should not be a problem finding discus.

One of the aquarium shop owners told me not to buy only two discus because they would fight. If that is so, how many do you think I would be comfortable with? I have but one extra aquarium, of 35 gallons, and I use only sponge filtration for my other tropical fish, which include angelfish, small tetras, and bottom catfish. I hope this gives you some idea of my situation here in New Haven, Connecticut.

Katy Gardner
New Haven, Connecticut

Dear Katy,

Purchasing only two discus for the tank will more than likely be a mistake even if both fish are the same size. The reason is that sooner or later—usually sooner—one of the two fish will exert its power in the aquarium and totally dominate the second fish, preventing its tankmate from feeding or swimming freely without being chased or harassed. If this persists for an extended period, the second fish will cease to grow normally and, in some cases, will eventually die. It is best to initially purchase at least four or five discus, in which case, the dominant one won't be able to take its aggression out on a single fish, and with four or five tankmates, there will be enough movement and confusion at feeding time to give all of them a chance. Why not simply move the dominant fish in the first place so that the fish can settle down? In a group of four or five discus, the second most dominant fish would then take over. This is, of course, nothing more than the natural pecking order establishing itself.

Andreas Gradin/Shutterstock

When purchasing discus, choose the most robust fish in the tank.

It is wise to have some basic knowledge of freshwater fishkeeping before making the initial discus purchase. With that in hand, probably the best size fish to purchase would be approximately 2 inches. At that size, they adjust quickly to their new surroundings, much more so than larger discus do, and they do not suffer trauma or stress in the move from the dealer's tank to the hobbyist's tank. This is critical if your discus have been purchased from an out-of-state dealer and have been shipped to you by air freight.

If you are in a position to personally select your discus from the dealer's tank, there are several guidelines you should follow. First, choose the largest, most robust fish in the tank. Does that mean you will end up with all males? No, not necessarily. At the 2-inch size, it is too early for the males to have begun to develop into a larger size than the females. Also, make certain that the dealer has not just fed the discus in that particular tank because transferring any discus from one tank to another on a full stomach will probably result in their getting sick, most likely from a bloating condition caused by stress.

The size of the eyes in relation to the overall size of the fish should give a clear indication of whether or not the fish have been given the proper care during the crucial grow-out period. The eyes should be red or orange in color and small in size. Eyes that are dark gray or black in color or abnormally large indicate poor care or an existing disease.

In the home aquarium, your discus should be up to the front glass in the tank and actively looking for food when you enter the room. In the dealer's tank, the young discus should be active and moving about the tank with authority. If any are dark in color or huddled in a back corner of the tank, they are probably sick.

Many young discus manifest visible fin or gill deformities, nearly always attributed to either a genetic problem or a water problem. A fin deformity will usually show up as a malformed anal fin. There are times, however, when the fin deformity is caused by a bacterial problem in the water while the fry are very small and delicate. I have, on occasion, seen tiny discus in tanks with what resembled a true bacterial bloom in the water, in which case the fry were destined to have deformed fins. When the gills on the fish are not properly formed, poor water quality or a genetic imbalance is generally the cause. When either of these deformities is caused by poor water quality, the young fish can still be used as future breeders, as the gill and fin problems will not be passed on to the next generation. On the other hand, most of us do not want to raise young deformed fish in hopes of being able to eventually breed them.

I suggest that you maintain the discus water temperature at 82°, whereas I'm certain you probably keep a 75° temperature for your other tropicals. If you do purchase the 2-inch discus, they should be eating the same food you feed your other fish, unless you have been feeding frozen bloodworms to them. Discus, especially young discus, do not really do well on a bloodworm diet.

Water changes of at least 35 to 40 percent daily will allow your young, growing discus to put on credible size quickly. And until the discus reach the size and age for breeding, the water you are using for your other fish should be suitable.

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Top 10 Most Influential Cichlids

Ted Judy is an aquarist with over 25 years of fishkeeping and breeding experience. He is a generalist who enjoys all types of fish, from anabantids to tetras, and always finds plenty of space in his fishroom for species from West Africa—especially the dwarf cichlids. Ted has served on the Board of Trustees of the American Cichlid Association and is an active member of the Milwaukee Aquarium Society. Ted also maintains the websites www.tedsfishroom.com and www.forum.apistogramma.com.

ted judy

photographs by the author

There seems to be a preoccupation with ranked lists in pop culture these days. The "docu-musement" television channels are full of shows about the ten deadliest insects, the most ferocious plants on the planet, or some other list of things that you would probably never think about had you not turned on the TV.

I was asked a few months ago to put together a program about the history of cichlids in the aquarium hobby, and the research for that project spawned the idea of producing a list of the most important cichlids in the hobby. By "important" I mean "influential": the cichlids that, in my opinion, have had the greatest impact on the keeping of cichlids in aquariums. I have even ranked them.

10. The Chanchito (*Australoheros facetus*)

To the best of our knowledge, the chanchito from South America was the first cichlid to be kept and bred in an aquarium. The most likely candidate is *A. facetus*, which was introduced into the European aquarium hobby in the late 1800s as *Cichlasoma facetum*, made its way to North America shortly thereafter, and proved to be a very easy species to spawn in captivity.

The genus *Australoheros* may be relatively young (Rican, 2006), but just about any aquarist into keeping South American cichlids in the middle of the last century would have been familiar with the chanchito. More recent collections in Argentina and Uruguay have brought several new varieties of fish in this group into the hobby, including the very colorful *A.* sp. "red ceibal."

Chanchitos are robust, powerful 6- to 8-inch fish with a typical large-cichlid attitude. They are easy to keep in just about any water parameters and will produce large numbers of fry regularly. But they are not the most popular of cichlids, so they make the list of most influential on the basis of their history. They were the first, so they get credit for the beginning of the cichlid craze.

9. The Oscar (*Astronotus ocellatus*)

The oscar cichlid is one of the most recognizable cichlid species in the world. Ask a casual aquarium keeper to describe a cichlid and the terms "large," "mean," and "predator" will often be used. Though those are general attributes of the oscar, they are not uniformly accurate.

Many cute baby oscars find their way into a new hobbyist's 10- to 20-gallon aquarium because they are justifiably neat little fish. But they will not stay little for long, and the unsuspecting aquarist gets some firsthand experience with trying to manage a big cichlid in the wrong conditions. Most of these oscars end up back in the store, and most of the aquarists swear off cichlids forever. So one reason the oscar makes this list is for the negative impact it has on the reputation of cichlids.

But it is also one of the most commercially successful cichlid species in the hobby. The oscar first appeared in aquariums in the 1930s, and by the 1960s, they were being produced on fish farms in large numbers. Tank-strain color varieties soon appeared, and today there are dozens of different color morphs from nearly solid red to albino. Recent imports of new wild populations have rejuvenated interest from the South American cichlid specialists, and the colorful tank strains are here to stay. *A. ocellatus* also makes the list because it is arguably the most popular large and aggressive cichlid of all time.

8. The Convict Cichlid (*Amatitlania nigrofasciata*)

The convict cichlid is another of the fish that most aquarium keepers recognize immediately as a cichlid. It is often the first species that budding fish breeders are successful with. The convict cichlid has also been around in the hobby for a very long time and is a good representative for the entire genre of Central American cichlids. They are produced in large numbers commercially and have tank-strain color forms that include white, calico, and blue.

Populations in the wild are found in the coastal rivers and streams on the Atlantic coasts of Honduras and Guatemala, from where traveling aquarists will occasionally collect a new population and introduce it to the hobby. Compared to the larger cichlids from Central America, the convict is very manageable in smaller aquaria but also right at home in larger tanks. This species will always have a place in the hobby.

7. The Common Krib (*Pelvicachromis pulcher*)

If I were biased, the krib would be ranked a lot higher. It is my all-time favorite aquarium fish. *P. pulcher* is the prototypical West African dwarf cichlid, and it has been a popular species in the aquarium hobby since at least the 1950s. The krib has become so integrated into the aquarium industry that it is considered a "bread and butter" species, and its presence in an aquarium store is as expected as neon tetras, albino cory cats, or guppies.

This cichlid also has done much to bust the myth that all cichlids are aggressive, because it has proven to be perfectly happy in a peaceful aquarium community. Pairs breed readily, are exemplary parents, and provide hours of entertainment with classic cichlid brood-care behaviors. Because it's small enough to be comfortable in 20 gallons, the krib is a great candidate species for a large number of hobbyists.

6. The Cockatoo Dwarf Cichlid (*Apistogramma cacatuoides*)

The cockatoo dwarf cichlid is the most recognizable of the very popular *Apistogramma* genus. *A. cacatuoides* makes this list not only because it represents its genus, but also because it is usually the first of that group that advancing hobbyists are successful with. I like to call it the "gateway apisto," and after having some success with the cockatoo cichlid, most hobbyists want to find and keep as many dwarf cichlids as they can.

A. cacatuoides is the most commercially successful species of its genus. It does not require water conditions that are difficult to maintain, is happy in small aquariums, breeds easily, and produces large spawns. Far more cockatoos make it into tanks from farms and breeders than from the wild, and all the success in breeding has resulted in many beautiful forms with a lot more color than the wild originals.

■ Common kribs are known for being less aggressive than many other cichlids and are perfectly capable of living in a peaceful community tank.

■ The cockatoo dwarf cichlid (*Apistogramma cacatuoides*) is easier to maintain than many of its congeners, breeding readily and prolifically.

5. Food Tilapia (*Oreochromis, Sarotherodon,* and *Tilapia* spp.)

The top 20 tilapia-farming countries in the world produced 3.5 million tons of these *Oreochromis*, *Sarotherodon*, and *Tilapia* spp. in 2010, which ranked third in total farmed fish production behind carp and salmon. Farmed tilapia has done more to improve the protein availability for human consumption in developing nations than any other animal, and the fish has become a staple, inexpensive food all over the world.

■ Rift lake cichlids, such as *Cyphotilapia frontosa*, with their fantastic looks, increased the popularity of cichlids in the hobby.

But all that benefit has come at a horrible cost. Tilapias are now the most invasive fish species on the planet. Tilipias from Africa are now common in wild ecosystems all over Asia, Central America, and southern North America and in some parts of South America. They are also invasive in Africa, where they have been transplanted from their native ranges to other areas. Tilipias should be welcome in the aquarium, however, especially the smaller species, such as *T. ruweti*, *T. joka*, and *T. snyderae*.

West African cichlid specialists have recently been turning their attention to this underappreciated group of cichlids, so they continue to find a place in the hobby. But they make the top-10 list because of their significant impact on our global economy and tropical habitats.

4. The Blue Ram (*Mikrogeophagus ramirezi*)

The blue ram cichlid is the most popular and commercially successful dwarf cichlid of all time. Its small size, incredible colors, peaceful attitude, and ease of reproduction combine to make the ram a near-perfect aquarium fish. "Near" because it can be prone to disease and suffer from poor water quality.

M. ramirezi is a South American dwarf cichlid with a wide range in the Orinoco River basin of Venezuela and Colombia. Wild fish are still imported on a regular basis, but the tank-raised fish have developed over the years a wider tolerance of water parameters than the wild fish. All rams require very clean water and prefer warm temperatures (78° to 82°F). Commercially produced strains include the very robust German blue ram, the gold ram, and the recently introduced electric blue ram.

3. The Discus (*Symphysodon* spp.)

How many species of discus are there? The debate rages on. The discus is regarded by many to be the king of aquarium fish, but there are many aquarists who do not realize that discus are cichlids. There is no

denying their regal appearance and elegant nature, but the fish is as challenging to keep as it is beautiful.

Discus are specialists' fish. The most important factor in their maintenance is pristine water. Frequent, large water changes are generally required. When the goal is keeping discus, all aspects of the aquarium need to be aligned with their needs, which is why the discus will never be found in most aquariums. The influence of discus on the tropical fish industry, however, is still very significant, and there will always be scores of hobbyists who keep this regal cichlid.

2. Rift Lake Cichlids: Species from Lake Malawi and Tanganyika

I cannot simply pick a single species from the East African rift lakes as a representative of this extremely diverse group of cichlids. I am probably not being fair grouping the fish from both lakes together, because they are so different in so many ways. But the influence these collections of cichlids have had on the hobby is basically the same.

The first commercial importations of fish from these lakes in the late 1950s and 1960s heralded an explosion in the popularity of keeping cichlids as a hobby in and of itself. Rift lake fish have driven the meteoric rise of the prevalence of cichlids in aquariums. Keepers and breeders became collectors of the many different species that are still being discovered an introduced. Most of these cichlids are relatively easy to breed, and many hobbyists discovered that the demand for the fish they produced helped them fund their hobby, which helped usher in the age of the "home hatchery."

There are other species that may be individually more popular than any one species from the rift lakes, but as a group, there is really only one cichlid that has had a greater influence on the aquarium hobby.

And that cichlid is . . .

1. The Angelfish (*Pterophyllum scalare*)

There is not a more recognizable aquarium fish than the angelfish. This incredibly popular species has been kept in aquariums since the early 1900s and is the most commonly kept cichlid in the world.

The angelfish is valued for its uniquely graceful shape, elegant fins, striking color patterns, and interesting behaviors. Many different tank strains of *P. scalare* have been developed over decades of captive breeding, and there are thousands of hobby breeders who work with only this species.

A number of genetic studies have been done on the species (most notably the classic work of the late Dr. Joanne Norton in the 1980s and 1990s). There is probably no other aquarium fish that we know more about when it comes to the inheritance of specific traits. Breeding angelfish has become a cottage industry in America, and most stores have developed relationships with local breeders to get quality, locally bred stock. That makes *P. scalare* the most commonly bred cichlid in the hobby.

The angelfish earns the number-one spot on my list because it is a more recognizable species, appeals to more hobbyists, and is more understood and more commonly bred and kept than any other cichlid species.

There are certainly many deserving cichlids that did not make it onto my list. This is a fun debate, so feel free to find me at an aquarium event and tell me how wrong I am.

the planted tank

Exciting New *Sagittaria* Species

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

amanda wenger

photographs by the author

For several decades, the aquarium plant scene has been dominated by just two species representing the genus *Sagittaria*. Most recognized is the so-called dwarf sag, traded in the hobby as *S. subulata* (the accuracy of that name is a matter of some debate). Also commonly available is the giant or broadleaf sag (*Sagittaria platyphylla*). A third species, *S. teres*, is occasionally traded in the international market but, oddly enough, is rarely seen by US hobbyists despite the species being of North American origin. Recently, however, a few more members of the genus have been finding their way into the hobby, bringing new options to aquascapers and collectors of unusual aquatic plants.

The name *Sagittaria* is Latin in origin and means "relating to an arrow" (consider, for familiarity, the constellation Sagittarius, the archer). The reason for this is more readily apparent among the semi-aquatic species of the genus, which almost universally have arrowhead-shaped leaves (in botany terms, this particular leaf shape is described as "sagittate"—note the recurring theme). Most of the semi-aquatic species bear the common name of "duck potato" due to the edible, potato-like tubers they're known to form. The truly aquatic members of the genus, on the other hand, tend to have lanceolate (tapering at both ends) to strap-like leaves. Of the some 30 species in the genus, the majority are native to the Americas, with a handful in parts of Europe and Asia.

The closest relatives to *Sagittaria* prevalent in the aquarium hobby are the swordplants (genus *Echinodorus*) and chain swordplants (genus *Helanthium*), all of which belong to the water plantain family (Alismataceae), but visually speaking, sag has always been most likened to vals (*Vallisneria*), both genera being known for their long, ribbon-like leaves. They share a further similarity in the sense that the hobby-staple varieties of both are known for being easy-to-grow, low-light plants.

New Sag Species

In the past couple years, a handful of additional *Sagittaria* species have come to the attention of hobbyists in the US, mostly introduced via aquatic plant club collections. Perhaps foremost among these is *S. graminea*, a fascinating midground species with an unusual profile. The plant maxes out around 6 to 7 inches tall, with a rosette of broad, strap-like leaves with pointed tips.

Though it seems to prefer brighter and more nutrient-rich conditions than its more prevalent cousins, the plant is not particularly difficult to maintain overall. It is, however, a rather slow-growing species—slow to settle in and not particularly eager to produce new plants.

Like most other *Sagittaria* in the hobby, *S. graminea*'s leaves are uniformly medium green. From an aquascaping perspective, the plant can be an interesting foil for the narrower leaves of *Blyxa japonica* or a great shape and color contrast for *Cryptocoryne* species and similar midground plantings. For a tank featuring only grassy plants, it would do well placed in between a foreground planting of *Lilaeopsis brasiliensis* or *Helanthium tenellum* and a background consisting of *Vallisneria* or *Cyperus helferi*.

Even more recently introduced is the diminutive *S. montevidensis* sp. *calcyina* (also sometimes referenced as *S. calcyina* var. *calcyina*). Though the standard *S.*

A fairly new species to the hobby, *Sagittaria graminea* is a popular midground plant that reaches around 7 inches in height.

A relatively undemanding plant, *S. montevidensis* sp. *calcyina* will grow at an extremely slow pace in a low-tech tank.

montevidensis has long been known to the pond trade due to its striking white and crimson-to-burgundy flower (most *Sagittaria* flowers, including *S. montevidensis* sp. *calcyina*, being a solid white), this subspecies suited to aquarium life has been available to hobbyists only since early 2013. I acquired a specimen shortly afterward, and my observations thus far are that the plant is not terribly demanding, though under low-tech tank conditions, its growth is positively glacial.

I'm currently maintaining it in a 5-gallon acrylic, flat-back, hexagon tank with a 13W T5 bulb and a rich substrate but no CO_2 supplementation. I do suspect that some additional CO_2 would go a long way toward encouraging more rapid growth and/or the production of new plants, but I'm rather fond of testing plants to determine the minimum conditions necessary to sustain them.

In terms of appearance, however, *S. montevidensis* sp. *calcyina* is something of an intermediate between *S. graminea* and the true *S. subulata*. It's a small plant, roughly 2 inches tall, but it has a broader leaf that tapers to a point at the tip. If it grew faster, it would make for a lovely foreground carpet, but it seems to be likely that the plant is more suited to use as an accent with other foreground plantings.

For another interesting design point, both *S. graminea* and *S. montevidensis* sp. *calcyina* bear a bit of a resemblance to the popular but demanding plants of the pipewort family, Eriocaulaceae, referred to in the hobby as "erios." In particular, the namesake genus, *Eriocaulon*, features a number of rosette plants with long, grass-like leaves, much like *Sagittaria*. To successfully keep a tank featuring erios, strong lighting and soft water are strict requirements, limiting their use among hobbyists who have a difficult time meeting those conditions. These new *Sagittaria*, however, are far more forgiving of lower lighting and hard water. It would be very interesting to attempt a "*Tonina*-style" (an offshoot of Dutch-style aquascapes featuring a variety of Eriocaulaceae species, named after another genus in that family) tank layout that substitutes a variety of *Sagittaria* specimens.

Will the Real *Sagittaria subulata* Please Stand Up?

There is a great debate surrounding the identity of the plant the hobby refers to as *Sagittaria subulata*. This is mostly derived from the size of the plant—true *S. subulata*, collected from its native environment in the mid-Atlantic coast, doesn't seem to exceed 2 inches in height, making it an excellent foreground plant. The plant the hobby trades under that name, however, tends to become much taller when exposed to certain degrees of crowding, turning into foot-high jungles especially reminiscent of *Vallisneria*. The hobby version also seems to be something of a faster grower than the real deal.

So what is the true identity of the "hobby" *S. subulata*? No one's entirely sure. Some of the theories postulated include a regional variation, a subspecies, a hybrid, or even an altogether different species. Further study of inflorescence specimens will be necessary if any determination is to be made. In the meantime, we might as well call it by the established name (though I prefer to make note of the "hobby" status of the ID).

Regardless, the real McCoy is now available to hobbyists, sourced from a few localities in Virginia and Maryland.

True *S. subulata* is a foreground plant that reaches only 2 inches in height.

This true *S. subulata* is a decidedly small plant and has something of a rounder, thinner profile than the strap-like leaves of the hobby version. Visually, the plant is somewhat similar to a few of the *Lilaeopsis* species available to the hobby. Like other *Sagittaria*, it has a tendency to take awhile to settle in to a new environment before it gets around to sending out new runners, but it is at least somewhat quicker to propagate than *S. montevidensis* sp. *calcyina*. Unlike the various other species, true *S. subulata* can occasionally pick up reddish tones under particularly bright conditions.

A Variety of *Sagittaria* for You

With the increasing variety of *Sagittaria* species being brought to the hobby, there's bound to be one that suits the needs of any planted-tank enthusiast. Next time you consider creating or adding to a planted tank, try one or more of these varieties to bring something new and unusual to your collection.

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into the labyrinth

African Bushfishes (*Microctenopoma* spp.)

Mark Denaro has been keeping freshwater aquariums since 1970 and marine aquariums since 1976. He currently operates Anubias Design (www.anubiasdesign.com), an aquarium and terrarium design, installation, and maintenance company serving southeastern Pennsylvania, and an 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

photographs by the author

The African bushfishes are interesting subjects for aquarists. There are currently 17 recognized species in two genera. All the known fish were members of the genus *Ctenopoma* until Norris erected the genus *Microctenopoma* in 1995 when describing *M. nigricans* and *M. uelense*. Ten previously described species were subsequently moved to the new genus.

The differentiation between the two genera is based on several morphological factors, including differences in the skeletal structure, labyrinth organ, and number of segmented caudal rays (14 in *Microctenopoma* and 16 in *Ctenopoma*).

The most significant difference for aquarists is the mode of reproduction. Members of the genus *Microctenopoma* are bubblenest builders while members of *Ctenopoma* are egg scatterers. There are additional differences among the current members of the genus *Ctenopoma* that will, in all likelihood, lead to their being further divided in the future.

Ctenopoma means "comb cover" and refers to the raised ridges on the gill cover of the males. It is not clear whether the genus name *Microctenopoma* refers to the fact that this feature is less defined in its members or to the overall size of *Microctenopoma* spp., which are generally smaller than their *Ctenopoma* relatives.

Members of the genus *Microctenopoma* are included in the family Anabantidae, indicating a close relationship with the other labyrinth species native to Africa, the members of the genera *Ctenopoma* and *Sandelia*. Their closest Asian relatives are members of the genus *Anabas*, which share their family affiliation. Collectively, these fishes are referred to as climbing perches or climbing gouramis, with the *Ctenopoma* and *Microctenopoma* spp. also going by the name of bushfishes.

A *Microctenopoma* Aquarium

The *Microctenopoma* spp. are peaceful and well suited to life in a community tank, though they prefer low-light, well-planted tanks. When planning a community, the hobbyist must choose between attempting to recreate a biotope and setting up an aesthetically pleasing aquascape that is not true to nature. Both choices are valid, and either can be interesting.

Creating a Biotope

If the choice is a biotope, the idea should be to recreate an overgrown bank of a small stream and the water conditions should match their natural environment, i.e., soft and acidic. The desired look can be created by incorporating driftwood, which can represent either roots sticking out of the bank or actual driftwood, along with plants that would grow on the edge of a small stream, such as *Anubias*, *Bolbitis*, and/or red or green tiger lotus, which is actually a *Nymphaea* species.

With the tiger lotus, you'll need to decide whether to let it form floating pads (yes, this is a true water lily). If you pinch the pads off before they reach the surface, the plant will produce more submerged leaves and will become more attractive, but if you let it form pads, they can provide a place for the *Microctenopoma* to attach their bubblenests. If you're setting up a species tank with the intention of breeding your fish, I would definitely recommend allowing the *Nymphaea* to form floating pads. If you're not planning to breed them, the choice is up to you.

Tankmates should be chosen with care to ensure they won't intimidate or outcompete the *Microctenopoma*. Appropriate tankmates for a biotope setup would include smaller West African characins, such as the various

Neolebias species; small barbs, such as the spectacular *Barbus jae* or the wonderful little butterfly barb (*Barbus hulstaerti*); and various killifish.

Pairs or single males with multiple females of species such as *Aphyosemion christyi* or *A. cognatum* would be good choices, or you could stretch the boundaries a bit and include smaller *Aphyosemion*, *Chromaphyosemion*, or *Epiplatys* species. Schooling killifishes, such as the lampeyes *Aplocheilichthys brichardi* or *A. myersi*, would also be appropriate, or you could choose the more readily available *Poropanchax normani*, which is bred in Asia and gets a little bit larger. The colors of the killifish are very striking in a setup like this.

There are some interesting catfish that will work well, too, but they can be a bit more difficult to obtain. *Microsynodontis christyi* is a very nice, small mochokid that is usually misidentified and sold as *M. batesii*. *Atopochilus*, *Belonoglanis*, *Chiloglanis*, and *Euchilichthys* spp. exhibit convergent evolution with the loricariids of South America and are real gems when one can find them.

Creating a Community Setup

If a biotope is not your goal, the range of choices becomes much wider but the plan of a well-planted yet low-light tank is still the best. The décor should be similar, but additional plants such as *Cryptocoryne*, *Aponogeton*, *Ceratopteris*, and *Microsorum* spp. will also work quite well. While the *Microctenopoma* spp. prefer soft, acidic water, they will adapt to hard, alkaline water. However, they are not likely to spawn in those conditions. Indeed, I kept both *M. ansorgii* and *M. fasciolatum* successfully in my very hard and alkaline tap water (pH 8.4 or so with general hardness approaching 400) when I lived in Indiana.

I've kept a number of South American tetras with them, including cardinals (*Paracheirodon axelrodi*), the various rummynose species (*Hemigrammus bleheri*, *H. rhodostomus*, and *Petitella georgiae*), numerous *Hyphessobrycon* species, the more active pencilfishes of the genus *Nannostomus*, and hatchetfishes (*Carnegiella* spp.), which add nice movement at the surface. I've also had good luck with numerous *Rasbora* and *Trigonostigma* species as well as the smaller Asian barbs, such as checkerboards (*Puntius oligolepis*). Livebearers are probably a poor choice unless your water is hard and alkaline. *Corydoras* species or smaller loricariids will add some activity in the lower levels of the tank, and the more peaceful loaches also fit in well.

■ Ornate bushfish (*Microctenopoma ansorgii*); aquatic plants such as *Anubias* and *Bolbitis* can be used to create a *Microctenopoma* biotope tank.

■ Female ornate bushfish are less colorful than males, with more rounded dorsal and anal fins.

■ Banded bushfish (*M. fasciolatum*) grow slightly larger than other *Microctenopoma* spp., reaching approximately 4 inches in length.

Ornate Bushfish (*M. ansorgii*)

There are two species of *Microctenopoma* that reach home aquariums on a somewhat regular basis while a third is occasionally available and the rest are seldom seen. The most colorful species is *M. ansorgii*, the ornate bushfish. Its color pattern makes it the most sought after and popular species in the genus. This species is featured in the logo of the American Labyrinth Fish Association, which should suffice to tell you how colorful and desirable it is.

M. ansorgii is native to the Congo River basin in West Africa, where it typically inhabits overgrown areas near the banks of small streams. Its overall range extends from Gabon through the People's Republic of the Congo and into the Shiloanga River system in the Democratic Republic of the Congo, formerly known as Zaire. Most, if not all, of the fish that are exported for the aquarium trade originate in the DRC.

The basic color pattern is a rather olive green with blackish vertical stripes that extend through the dorsal and anal fins with some orange in the unpaired fins. Males have longer, more pointed dorsal and anal fins. The male's colors intensify when in breeding condition, making this species truly spectacular. It can grow to just over 3 inches in length but seldom reaches that size. If kept in a brightly lit aquarium, this species tends to hide quite a bit. They can hide so well that you may think you've lost them. Back in the mid-90s, I had four of them in a 60-gallon hex that was heavily planted and brightly lit and included a large piece of driftwood; every time I'd decide that they were no longer in the tank, I'd see one or several of them. They didn't even come out at feeding time but lived in the tank for years.

Feeding is typically not problematic, as they accept most prepared foods. To condition them for spawning, live foods should be added to the diet. Mosquito larvae, daphnia, *Cyclops*, Grindal worms, and chopped tropical red worms are all excellent for promoting spawning. Small quantities of white worms can also be added, and some hobbyists like to feed black worms.

The spawning tank should be between 10 and 20 gallons in size and set up with a small sponge filter and soft, acidic water at about 78°. It should contain some floating plants, such as water sprite, and a great deal of Java moss, as the microorganisms living within it will provide an excellent first food for the young fry. *M. ansorgii* is fairly easy to sex, as the males develop longer dorsal and anal fins and are more colorful. After conditioning, the breeders can be added to the spawning tank. The male will build a bubblenest attached to the floating plants. After spawning, the female should be removed.

The male will care for the eggs and fry until they are free-swimming. When the fry reach that point, he should be removed. Let them feed on the microfauna in the tank for a few days, or add some infusorians as a first food. Newly hatched—and the emphasis is definitely on "newly"—brine shrimp nauplii can be added sparingly starting about day five or six. As soon as the fry are large enough to take the nauplii, they become fairly easy to rear. Powdered flake food may also be accepted at about this time but should not be more than half the diet.

Dwarf Bushfish (*M. nanum*)

M. nanum, the dwarf bushfish, is similar in size and pattern to *M. ansorgii*, but the color palette is more of a gray with blackish stripes and blue in the fins. This species is more commonly found in Cameroon than the DRC and is consequently not as readily available. I must confess that I have never kept it, though I hope to acquire some soon. Care, maintenance, and, presumably, spawning, should be the same as for *M. ansorgii*.

Banded Bushfish (*M. fasciolatum*)

M. fasciolatum, the banded bushfish, also calls the Congo River basin home. It is fairly widespread in the DRC and is regularly exported. It is slightly larger and more robust than the other two species. It is also far more outgoing and will hold its own in almost any aquarium as long as its tankmates are not overly territorial or aggressive. *M. fasciolatum* can grow closer to 4 inches in length.

Its color pattern is hard to describe. It is basically a brownish-gray base color with blue-black vertical, wavy lines surrounding lighter vertical, wavy lines. The lines are more prominent on males, and males also develop extensions to their anal and dorsal fins. All in all, it's not as strikingly colored as *M. ansorgii*, but it's an attractive species nonetheless.

I am currently maintaining a group of this species and plan to try something different with them this year. I'll be moving them into a pond in my yard for the summer. I've always had very good luck with keeping anabantoids outside for the summer but have never done that with a *Microctenopoma* before. I'm hoping they'll spawn outside and that I'll be able to bring in some fry this September. If that happens and I can get some good photos of the nest and the fry, I'll post an update to the blog on tfhmagazine.com.

If you feel like you've done the Asian anabantoids and are looking for something a little different, keep an eye out for one of the bushfish species from Africa. You'll be glad you did.

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adventures in aquascaping

Adventures with Inverts: The Pico Riparium Project Part 1, Planning the Tank

Lea Maddocks is a long-time fish enthusiast and has been a scuba diver since age 15. A biologist, Lea is fascinated with aquarium science, including fish and invert husbandry, planted aquariums, reefs, and the art of aquascaping. Lea now operates Acumen Aquatics providing aquarium installs, assistance, and maintenance. She supplies her own FinSafe betta ornaments, is an active member of the Canberra District Aquarium Society, contributes to several fish and aquatic plant forums, and has written for the Australian RSPCA on the nitrogen cycle, goldfish, and betta care. Lea owns three planted tanks, and routinely maintains many freshwater tanks, a turtle tank, a marine reef, and is a volunteer worker at the National Zoo & Aquarium in Canberra—in the aquarium section of course!

lea maddocks

photographs by the author

Those who know me in the hobby understand that I am confined to nano-land. Specifically, my darling other half refuses to be watched around the house by "soulless" aquatic eyes, and the compromise is that all my tanks must be pint-sized and live in my (wo)man-cave or maybe a cheeky one in a kid's room. Indeed, my "big tank" is a mere 60 liters (15 gallons). However, I love my tiny worlds, and the skills required to create and sustain them can often be challenging to develop, particularly when faced with limited room to play with and where a single errant leaf can be large enough to spoil a whole layout.

A few months after wrapping up my small aquatics business (to return to my regular career), I felt the need to get creative aquascaping with something new again. The opportunity for this came when a good aquarist friend listed a teeny-tiny, 9-liter (2½-gallon) tank for sale. It would be *just* small enough to squeeze on the other side of my desk (one side already houses an 18-liter [5-gallon]). And with a small pad heater and filter thrown in, I could not resist. I brought it home that day, sat it on my desk, then spent a while staring at this tiny box, wondering what potential it had despite the size restriction.

Planning Around the Tank: Filtration, Hardware, and Lighting

This little unit measures only 17½ cm (7 inches) wide x 15 cm (6 inches) deep (plus an extra 6½ cm [2½ inches] deep for the rear sump section) x 21½ cm (8½ inches) tall. It is one of the new breed of plug-and-play aquariums, with a built-in filtration area akin to a mini-sump behind a rear wall, divided into two parts. The small overflow section can be crammed to the gills (pardon the pun) with filtration media, and a pump on the other side draws up water from below and delivers it back through a small hole to the display area of the tank. Such a sizable area for mechanical and biological filtration easily covers the needs of such a tiny unit. Another plus is that the small pad-style heater that accompanied it can be slid into the filter area, concealing this as well as a thermometer. This leaves the whole front without any visible hardware—slick.

The next challenge was lighting. As the tank is open-top and very small, lighting it required a novel approach. This was easily achieved with a cheap and cheerful method I'd effectively used on nanos before—a simple black desk lamp with a flexible neck. As this tank is tall and has a narrow square surface rather than a long one suited for usual rectangular fittings, a desk lamp with a small, round head was chosen as it would provide ample coverage for the tank's footprint.

A lamp head housing a normal compact fluorescent bulb would have been bulky and would obscure the view of the surface, so I opted for a more compact, flat head housing a tiny 20-watt halogen bulb with as cool a light as I could find (which usually has a better balance of blue to red light; I could find no info on the Kelvin value for this bulb). Since the tank is also very shallow given its overall size, the intensity of this light would be more than enough for my needs.

For those familiar with the watts-per-gallon rule, it just breaks down on a tank this small—though at 20W to 2½ gallons, it could be considered overkill. As I wished to keep the view of the surface and aerial vegetation as clear as possible, the lamp was placed to the side of the tank and the head was bent over the surface, hanging a few centimeters (an inch or so) above the water line. It's important to note also that the lamp chosen had a glass panel covering the bulb, so no condensation

or splashed water could hit the bulb and cause a short or shattering. The lamp head was also positioned on a slight angle to illuminate the entire submerged area while keeping most of the lamp head to the side and out of the way. This also helped to keep the above-water areas relatively dark above the first few centimeters—as I wanted that part shady.

Planning for Planting Above the Tank: Aerial Scaping

Now for the fun and often most daunting part—planning the layout. This task included factoring in the most exciting aspect of this tank, the open top. This provided a welcome opportunity to try out a few tricks I'd seen in *TFH* issues past, namely creating a riparium and using emergent growth. Full credits to Jacob Jung ("An Introduction to Planted Ripariums," *TFH* December 2011) and Amanda Wenger (author of "The Planted Tank" monthly column) for piquing my interest!

For the uninitiated, a riparium differs from a traditional paludarium. A paludarium includes a land-based section in addition to an underwater environment. This shore is often planted and acts as a refuge above the waterline where animals can climb out for a while if desired (and if they are amphibious). On the other hand, a riparium has no actual shore or land but creates the illusion of this, presenting a scene where marginal plant growth meets the water. This is created by the clever use of semi-floating planters for emersed plants, as well as a combination of floating surface plants, moss, and/or hardscape to camouflage the planters and complete the deception. But how do you create an aerial section in such a small tank? The solution to this problem presented itself with a closer inspection of the rear filter section and some crafty hardscaping.

First, I would use a bit of pre-assembled emergent greenery—lucky bamboo. Actually, it's not bamboo at all, but juvenile canes of *Dracaena brunii*. This would add some neat trunk-like stems to the below section and raise the eye up to the leaves, which must be kept above the waterline for this plant to grow. Nice idea, but how to incorporate it into a riparium? I had to blend it into my riverbank, and this led to some required hardscaping over the sump.

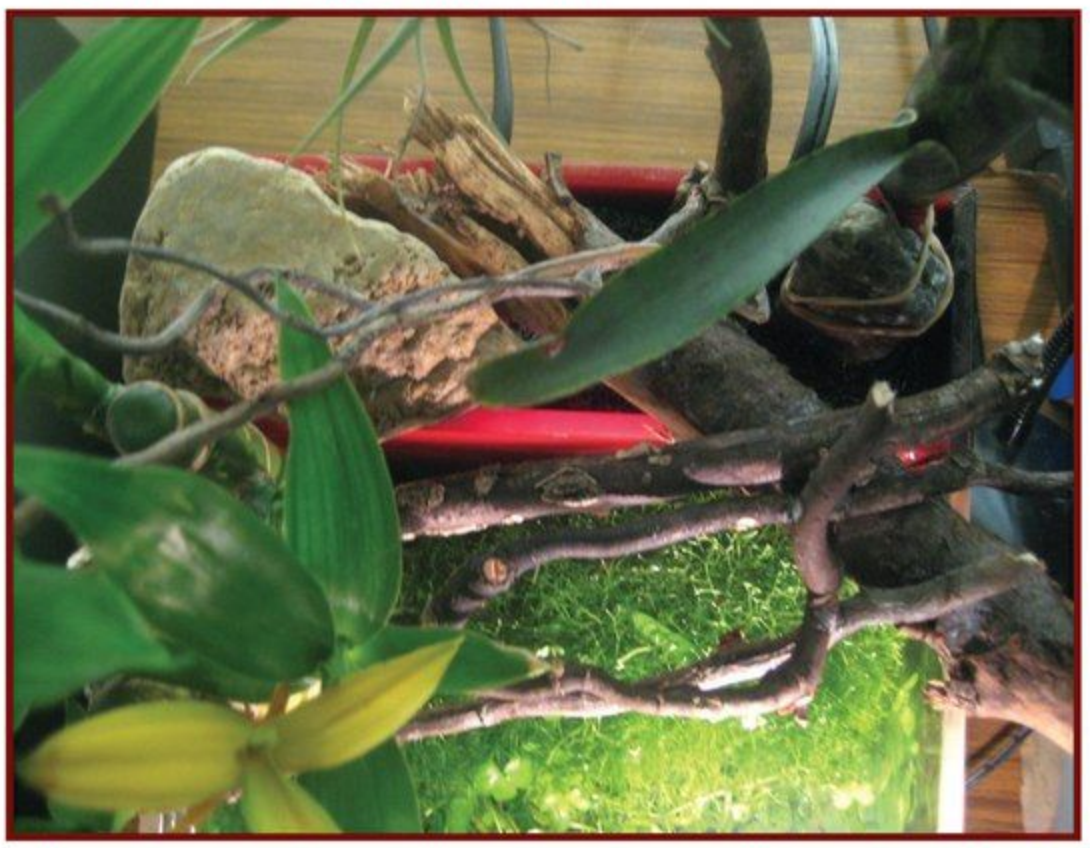
The rear mini-sump is about 6½ cm (2½ inches) deep and runs the length of the back wall, and the heavy packing of filter sponge left a small ledge to rest things on. Provided any items could be easily removed to clean the filter and media, I could use this as a base for my terrestrial section. I decided (as I often do) to take a novel approach and compile a design of twigs, which I could glue together and rest on the top, but in such a manner that it could be removed in a single piece with ease for maintenance. I ended up covering one side of the sump with a rock that I could lift to access the pump and thermometer and resting a thicker branch diagonally across the sump and over the surface. Smaller twigs could be glued to this branch to create some finer points.

Always trying to get my kids bitten by the aquarium bug, I asked my wonderful six-year-old daughter to critically appraise my early sketch. She grabbed a pencil and paper and proceeded to expand on the stick idea to use more tiny branches laid across the tank just in front of the stick structure *and* in front of the bamboo canes. This, I was informed, would help make the front and back match up better. Genius, I thought. This would certainly marry the sections together and provide a kind of trellis to grow some emergent plants over from the riparium water surface. Plus it would look like fallen logs by a river bank, or such was the grand design!

Again, due to size, any hardscape items had to be very delicate to avoid overwhelming the layout or making it too top-heavy. A local tortured willow tree (which grows interesting, highly contorted branches) provided great fodder for this, and I spent quite some time looking like a fool collecting a range of small, thin, gnarled twigs and sticks that had fallen to the ground below it (note: I had full permission from the garden owner for this and took only what had naturally fallen, and then only a few handfuls for my miniature scene).

Once I had the rough illusion of an embankment, I needed to think about how to complete the top of my pseudo river margin before saddling up and starting the emergent plants. What remaining plants could I possibly plant on a pile of humid sticks? Being a fan of indoor plants, I could see this would be a perfect place for air plants.

■ The author used a combination of rocks and fallen tortured willow tree sticks to create a rough embankment.



■ Indoor household plants were placed among the rocks and twigs to create an aerial arrangement.

■ The lamp was placed over the water section of the aquarium, and ambient lighting was used for the aerial plants.

What are air plants? These are often seen by the public stuck to novelty fridge magnets or statues, and they come in many forms. The ones most commonly seen are from the genus *Tillandsia*, which contains hundreds of species. Originating from arid climates through to humid rainforests, they grow attached to tree branches or from piles of decomposing organic matter among branch forks. These plants might be thought of as terrestrial versions of Java fern or *Anubias*, with their "roots" acting as little more than anchors as they absorb all they require though their leaves, including water. Being both tough and chiefly rootless, they have wide applications as decorative plants and can be tied, glued, hung, or just left sitting at a certain spot. As long as they are misted and/or soaked a few times a week and not exposed to frost or intense direct sunshine, they will thrive. Even left neglected, they often endure until you remember to water them.

They also tend to grow slowly, which, in my case of limited space, is quite beneficial. Furthermore, as these plants grow well in moderate light, they will do very well in the ambient room light accompanied by some indirect light from my low lamp head. The logic (yet to be proven) was that the lamp would provide strong light to the submerged growth and a small amount of emergent growth, but remain low enough to provide just indirect lighting to the air plants and lucky bamboo leaves above. This way, I could avoid installing a pendant light above, which would look a little overwhelming. Also, the air plants could be sustained by the humidity from the open top and I could feed them regularly with a squirt of old tank water, which contains a nice meal of dissolved nutrients.

For my air garden, I chose a variant of *T. ionantha* glued to a branch; Spanish moss (*T. usneoides*), which was draped over the whole twiggy mass; and a member of the same family as the *Tillandsia*, a small bromeliad, *Neoregalia pauciflora*, tied to a rock. Bromeliads are similar in their habit to air plants, but the center of their leaves creates a cup that must remain filled with water to survive. The contrast of its wider and spotted leaves would hopefully work well. (Note: a larger species was used at first. It was exchanged for the smaller variety as it overwhelmed the layout.)

The top section was underway—now it needed filling in with some creeping emersed growth. See part two for getting started on the aquascape and beginning to bring air and water together with my first adventure in making riparium planters.

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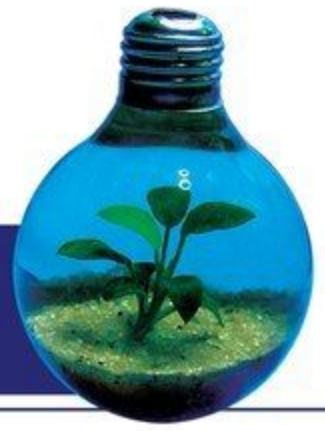

going nano

Stinging Celled Life: Corals and More for Small Marine Aquariums

Bob Fenner is an aquatic Renaissance man. His professional life has included jobs in tropical fish retailing, wholesaling, collection, photography, research, aquarium maintenance, and writing, while he is an accomplished freshwater, marine, and reef aquarist, and an authority on aquatic plants and ponds as well. Bob is a frequent speaker at national and local aquarium society events, a long-time TFH and Microcosm author, and the expert the experts go to for advice. For more from Bob, visit www.wetwebmedia.com.

bob fenner

Stocking corals together is a process fraught with danger. Simply put, they do not all play nicely together, and these organisms use a few deadly mechanisms to wage outright war with each other and other reef life for space and food. Keeping this phylum's contingent in smaller systems is even more precarious, with the danger becoming more dire with less volume and a greater mix of species.

This is not to say that it's impossible to stock them together, and with other life, in tens of gallons or even smaller systems; just that one needs to be that much more careful in choosing species, selecting specimens, and placing them among each other. Thankfully, there are some tricks of the trade that can save most grief.

To be sure, the chemical and physical warring abilities of stinging-celled life are formidable, and being haphazard in their stocking results in failure, loss of life, and, too often, hobbyists leaving the hobby. However, with some background, a plan, and care in execution thereof, small coral reef systems can be deeply gratifying.

The Issue in a Word: Allelopathy

Members of the phylum Cnidaria (formerly Coelenterata, in reference to their having only one in/out aperture to a central body cavity) are easily identified by their possession of cnidocysts—stinging and agglutinant (sticky) cells.

What this means to us as stocking aquarists is that all 9,000 plus species of hard and soft corals, sea fans, zoanthids, mushrooms, jellyfishes, anemones, and more need to be carefully handled, selected, acclimated, and placed to avoid havoc among this life if you choose to keep it in your aquarium.

In addition to cnidocysts, many, if not most, cnidarians produce chemicals that have decidedly detrimental effects on other sea life—not just other members of their own phylum. Again, the call here is to be knowledgeable considering what species and groups are more chemically toxic, place the less noxious ones first, do what you can to reduce altercations (and there is much here that can be done), and possibly eschew some species.

Workarounds

The one critical technique I hope you will strictly adopt is to utilize an intermediate isolation system for hardening new acquisitions and slowly introducing them to your established display tank. I'm sure you've heard and read urgings for hobbyists to quarantine new organisms—to give you time to examine them for good health, perhaps observe whether they or the substrate they're attached to has undesirable hitchhikers that you'd like to exclude, etc.—but here I want to emphasize the two aforementioned advantages and elaborate on the second.

Giving new arrivals a chance to rest up before permanent placement is a great idea in and of itself. This practice would likely prevent more than half of incidental, otherwise called mysterious, losses. Adding the following water-mixing protocol, after the new specimens have stabilized in your isolation system and assuring that you won't be transferring problems, would probably eliminate most of the remaining mortalities.

What this involves, simply put, is taking a few cups of water from this system and blending it in with the water in your main/display tank, and vice versa. In essence, giving organisms in both separate systems the chance to "smell" the soon-to-be new neighbors without being able to react overtly, attempting to poison or sting each other. After doing this daily over a period of a few weeks, you will notice a lessening of obvious reaction from your livestock. This can be very

important when introducing new cnidarian livestock to each other.

Notes on Use, Selection, and Placement of Different Coral Groups

Mushrooms, the Corallimorpharians

Mushroom corals are among the most popular cnidarians for small marine system use; they come in a variety of colors and physical/polyp types, smooth to hairy, and due to their being found in not-too-sterile natural settings, are quite tolerant of captive water conditions. *Discosoma* species are superior to less-hardy *Ricordea* spp. and more stinging *Rhodactis* spp. All need to have an eye kept on them lest they encroach on other specimens through asexual reproduction or cloning.

Soft Corals, the Alcyonaceans

There are more families of soft corals than hobbyists are generally aware of. Members of the family Alcyoniidae, made up of leather, toadstool, and other corals, are for the most part hardy, readily available, and easily cultured through asexual fragging. Their principal downsides are that they produce copious amounts of allelopathic chemicals and can easily overgrow hobbyist-sized systems. Start with small specimens (healed cuttings are a good way to start off a small system's collection), and then add other groups of small specimens once they're established.

Pulsing corals of the family Xeniidae, including small colonies of *Xenia*, *Heteroxenia*, *Anthelia*, and *Cespitularia*, are very appropriate for small systems given that system is very well established (let's say more than half a year going) and care is taken to isolate these soft coral colonies so they don't asexually reproduce and spread out of control. As with all species kept in captive systems, they are best started from cultured specimens.

Dendronephthya, known as carnation corals, strawberry soft corals, and more, in the family Nephtheidae are generally a hard group of species to keep in larger, more stable systems, requiring a plentiful supply of very small plankton for feeding. I encourage all but the most advanced to leave these in the sea.

Stony Corals, the Scleractinians

Stony corals, like soft corals, are capable of outgrowing their small environs and so must be placed to allow for expansion, growth, and ultimately for pruning. There are definitely families, genera, and species of stonies that do better in smallish systems, but all should be started as frags or small specimens to allow for sufficient space and discount chemical and physical warfare.

There still is a convention of (arbitrarily) distinguishing large- from small-polyped stony corals (LPS, SPS), and it has some use in stocking considerations for small systems. By and large, SPS corals are too difficult to maintain in small systems. The vacillation of water quality and meeting their feeding requirements just makes their husbandry too difficult. Yes, there are some folks who have (had) success in keeping SPS in nanos, but these aquarists are in the extreme minority. LPS are not necessarily easy either, with many being so aggressive in maintaining their turf that they require much space about them. Some of my favorite LPS choices include the dendrophylliids. *Tubastraea*, though being non-photosynthetic, or perhaps because of this trait, are favorites of mine. The genera *Dendrophyllia* and *Duncanopsammia* are also useful for smallish systems, when they are small, being relatively hardy and not too war prone.

Pineapple and brain corals of the genera *Acanthastrea*, *Blastomussa*, *Cynarina*, and *Scolymia* are my favorites. They don't require as much light or circulation as many coral groups, can be placed in many areas of tanks, and possess much shorter stinging tentacles than other LPS corals.

Brian Kinney/Shutterstock

■ Many, if not most, corals produce chemicals that can harm other corals.

Tyler Fox/Shutterstock

■ Pulse corals are good for nano systems as long as care is taken to prevent them from reproducing out of control.

Joao Pedro Silva/Shutterstock

■ As a general rule, corals from the genus *Dendrophyllia* are not too dangerous to other corals.

About Actinarians (Anemones) in Small Systems

Though I have encountered examples of successful keeping of larger Indo-Pacific anemone species in small systems, I urge caution in keeping them in anything smaller than 40 gallons. These life forms need space for expansion and dilution of wastes, and penning them in with fishes particularly, though not exclusive of invertebrates, often results in these being consumed and/or accidentally stung to death. The better candidates are *Condylactis* from the tropical West Atlantic and clones of the bubble tip (*Entacmaea quadricolor*).

Gorgonians

Though many gorgonians are too damaged to survive in any captive setup, there are species of sea fans that can be kept in well-maintained mini-reef settings. Seek out non-photosynthetic species of known hardiness, and assure that they are in good health before permanent placement.

Stoloniferans

For small systems, stoloniferans are limited to the mat-forming species of the genera *Clavularia* and *Pachyclavularia*. Due to their penchant for overgrowing other benthic-attached life forms and trend toward chemical activity, it's best to introduce these later to last in your stocking arrangement.

Zoanthids: Sea Buttons, Button Polyps, Colonial Anemones

The zoanthid group is a mixed blessing and curse of utility. On the one hand, they're hardy and many are gorgeous; on the other, they can be extremely, dangerously toxic to other sea life and the aquarist (so be sure to wash your hands thoroughly after handling them or being in their tank). Zoanthids should be placed last in established systems or, if this isn't possible, introduced/acclimated as detailed above.

About Maintenance of Cnidarians in Small Systems

Cnidarians not only produce noxious chemicals as mentioned over and over here, but they also, at times, absorb high quantities of biomineral and alkaline earth materials as well as other macro- and micro-nutrients from the water about them. Though one can rely on numerous test methods and specific supplement-replacement strategies, I encourage the employment of more frequent partial water changes for much of this re-centering of water quality, perhaps with some boosting of calcium, magnesium, and carbonates through their pre-addition and thorough mixing in makeup/change water.

Mixing Corals in Small Systems

This brief introduction is by no means all-inclusive; perhaps we'll have occasion to delve into the stinging-celled animals in greater detail on other occasions. My best advice when it comes to sorting through what's available and appropriate for your use is to keep apprised of what others are doing/using via hobby groups, reading, and the internet, and to stay ever-vigilant in observing your livestock.

Small marine systems can sustain cnidarians, or coral life, but are more difficult to stock compared with larger volumes. Not only must one pay attention to the lighting, circulation, and other needs per species, as well as recent culture conditions in placing specimens, but extra care must also be applied in starting with smaller colonies, placing less noxious species first, allowing space initially and for growth, and, importantly, acclimating new arrivals ahead of placement in the established display tank.

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A Look at the Coral Crabs

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

james fatherree

photographs by the author

There are several kinds of crabs commonly available to hobbyists for purchase, and crabs sometimes find their way into our aquariums as hitchhikers on rocks, corals, and such. Some of these crustaceans are suitable for life in reef aquariums and won't bother much of anything in a tank, but others can be destructive, killing other critters and sometimes munching on corals. However, many of the coral crabs are good ones.

Stony Coral Crabs

To start, there are several types of crabs that may be found living among the branches of stony corals, which are commonly called coral crabs. Some of these are undesirable, as they may feed on the tissues of the corals they live on, but many coral crabs don't do so. In fact, some of these crabs can actually be good for them.

The family Trapeziidae includes several species of these harmless coral crabs, most of which are found in the genera *Trapezia* and *Tetralia*. These are common reef inhabitants that live on various species of corals throughout the Indo-West Pacific and Red Sea areas, but there are others, such as *Domecia* spp., that you're not very likely to see.

There are several species of these crabs, but they're all shaped pretty much like any other regular type of crab you'll see, and do have a set of noticeable claws. However, they can vary dramatically in coloration, with some being almost all white while others may be brightly colored, mottled, or spotted. Regardless, they're all small, most well under an inch across, and can thus move about among the cramped branches of the colonial stony corals they live on.

Those belonging to the genus *Tetralia* are found living among colonies of various species of coral in the genus *Acropora*. However, crabs of the genus *Trapezia* are most often found on corals within the family Pocilloporidae, including *Pocillopora*, *Seriatopora*, and *Stylophora*. Apparently, some of them live on acroporid corals, too. It also seems that some species of these crabs are generalists that may live on various genera and species of corals, but others are apparently quite picky and may live only on one genus of coral or even one particular species of coral.

Wherever they may be found, they almost always occur in monogamous pairs, and they apparently like to stay that way. These pairs will aggressively defend their coral territory against other crabs of the same species, and fighting among them will eventually lead to the weaker crabs leaving the area to the stronger ones. However, they oftentimes are not bothered if crabs of a different species move into a coral and seem to get along fine with them.

Working Together

So, why do they live on corals? Well, for one thing, being able to move down into the branches of stony corals is a great way to keep from being eaten. Countless predatory fishes will eat small crabs, but the coral crabs' small size means they can avoid most fish big enough to eat them. Having something of a fort to live in is a great survival advantage.

While these crabs were long ago thought to dine on corals' tissues, it has been clearly demonstrated that they do not harm the corals at all. Instead, they are mucophagous, meaning they feed almost exclusively on the excess mucus produced by the corals. While you might not think it, mucus is very

nutritious, being carbon- and nitrogen-rich, and has a high lipid content. The crabs can live off the mucus and the nutrients from any detritus that becomes trapped in it. Stony corals can produce a lot of it, too, as 10 square feet of coral on a healthy reef can exude over a gallon of mucus per day—far more than enough to keep a few crabs going without having any detrimental effects on the corals.

That's only one side of this story, though. In a symbiotic relationship, two different types of organisms develop a close physical and/or biochemical relationship with each other, which is typically for life. A commensal symbiotic relationship is one in which one of the organisms in the relationship receives some sort of benefit from the other without negatively affecting it. At this point, I'm sure it sounds as though these crabs and their host corals have a commensal symbiotic relationship and that only the crabs benefit from the association. However, that's not the case at all. To the contrary, the two live together in a mutualistic symbiotic relationship, which means they both receive some benefit from the other. What do these little crabs do for their coral hosts? More than you'd think!

First of all, the crabs can be quite feisty at times and will fend off various other creatures that feed on corals. Numerous fishes and invertebrates eat coral tissue, and the crabs will take them on in an effort to keep their home and food source as healthy as possible. They'll even go after creatures much larger than themselves, including the relatively monstrous crown-of-thorns starfish (*Acanthaster planci*), which has been known to decimate large areas of reef when their populations get out of control, and the pincushion starfish (*Culcita novaeguineae*). These starfishes will crawl upon a coral and eat its soft tissue, but any coral crabs present will use their claws to repeatedly pinch the sucker-tipped tube feet the stars use to move around. This will typically lead to the stars giving up and moving on and can literally save the coral's life.

In addition, the crabs will work to keep their coral host clean. Wave activity, especially during storms, can blow sediment onto corals where it can easily settle onto relatively horizontal surfaces and down in the nooks and crannies between branches. Finer waterborne silt and detritus can also settle onto corals and accumulate. This is not good for corals, as it reduces contact between the corals' tissues and surrounding waters and can reduce the amount of

■ Here's one of the most commonly seen coral crabs, *Tetralia nigrolineata*, in the branches of an acroporid coral.

■ An unidentified coral crab of the genus *Trapezia* in the branches of an acroporid coral.

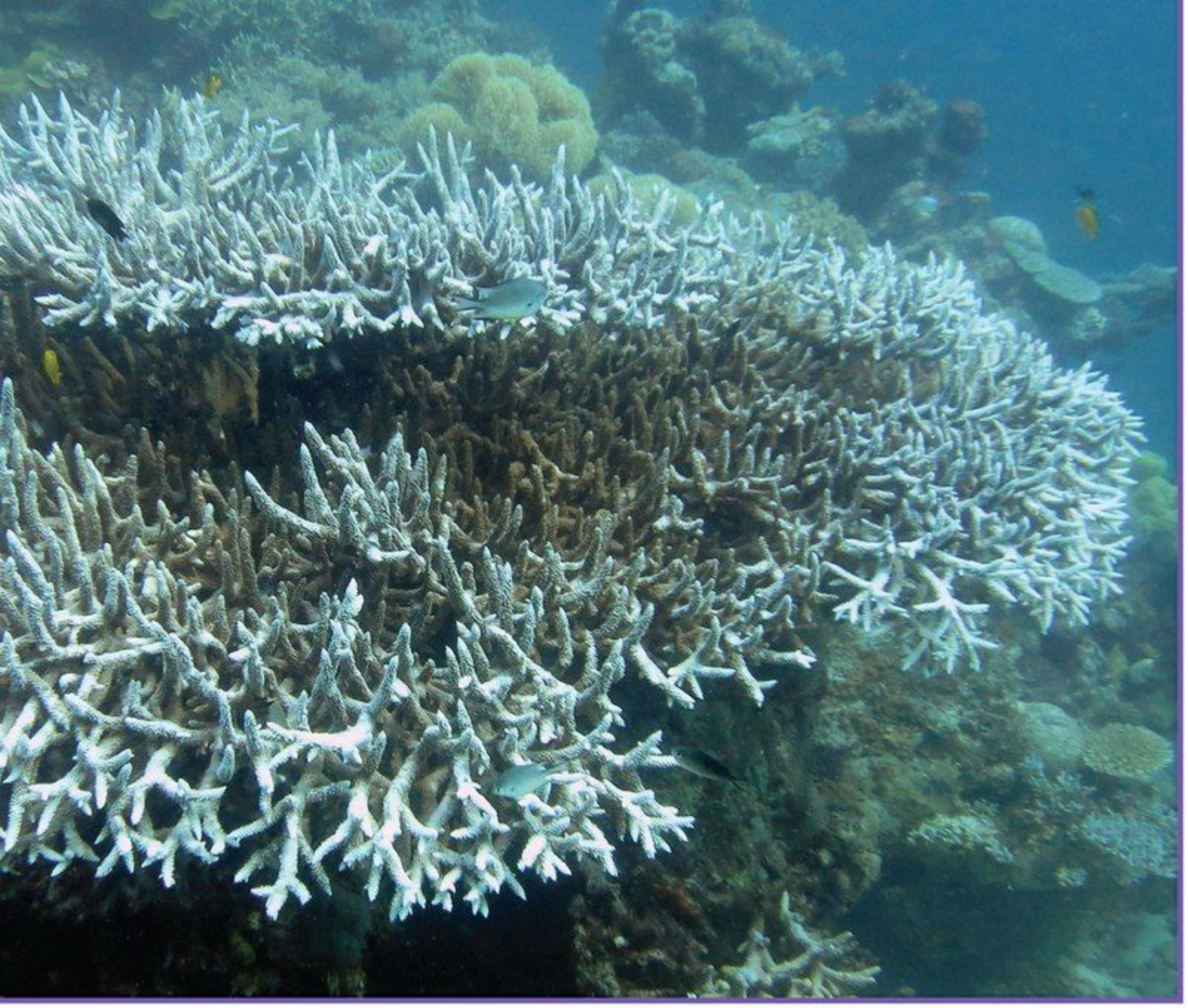
light that reaches the zooxanthellae living inside the corals' tissues, which lowers metabolism and growth rates and can prevent polyps from opening. This can lead to problems ranging from localized bleaching and tissue loss in some areas of a coral colony, especially near the bottom, to the death of the whole colony. Being cleaned off can be quite beneficial.

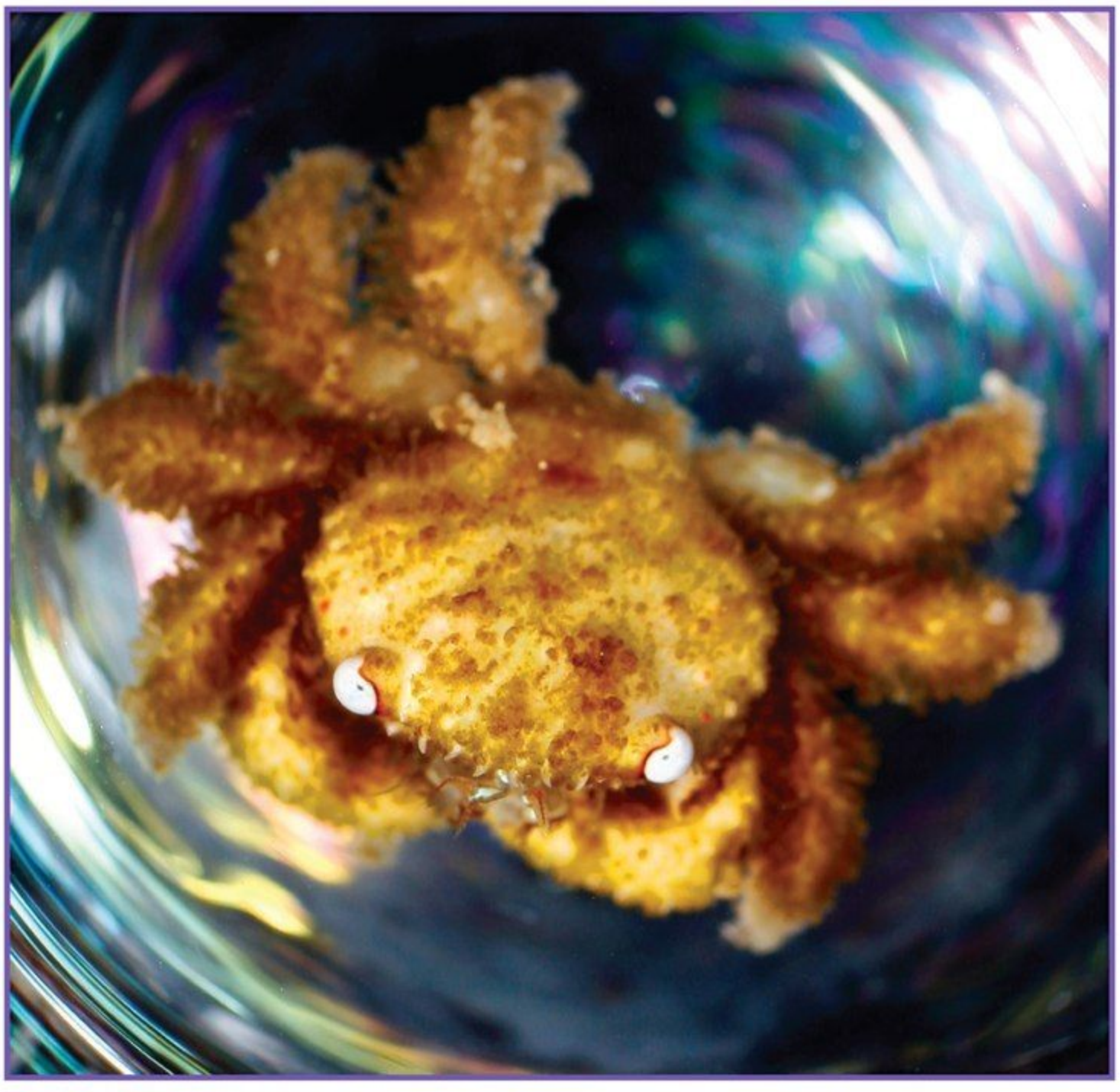
As material settles onto corals, the corals themselves can expand their polyps and slough away sediment-laden mucus in an attempt to clean themselves up as well as possible. The crabs will actively use their legs and claws to sweep away fine sediments and detritus, bit-by-bit removing larger grains of sand and gravel.

■ Reef waters often carry much more suspended sediment than you might think, and without the help of coral crabs, many corals can succumb to being blanketed by it.

This might sound rather trivial considering the diminutive size of the crabs, but it isn't. The importance of this cleaning behavior was underscored in a study conducted by Stewart, *et al.* (2006), in which a large number of *Acropora* and *Pocillopora* coral specimens were collected from a reef in French Polynesia and moved to a study area. All coral crabs were intentionally removed from some of the specimens in order to observe any changes in coral health. They carried out the same sort of thing in a large aquarium system.

After 24 days of sitting in sediment-bearing waters, all the coral colonies containing crabs had stayed sufficiently clear of sediments to survive. No surprise. However, things were very different for the crab-less colonies, which developed a clearly visible layer of sediment on their surfaces. Surprisingly, 45 percent of the *Acropora* specimens and 80 percent of the *Pocillopora* specimens died! In addition, the researchers found that the crabs were very effective at removing the relatively large sediments that the corals had the most trouble with and that growth rates were almost three times faster for the specimens with crabs relative to the specimens without crabs that didn't die. You can surely see that the corals benefit from having the crabs around.





■ Be sure to keep a close watch on any crabs like this that might show up in your aquarium, as some of them are coral eaters that will need to be removed.

■ Despite their small size, coral crabs can help defend their hosts from many coral-eating critters such as this pincushion starfish (*Culcita novaeguineae*).

Imposters

With that covered, let me say a few things about imposters. Not all little crabs found on corals are good for them, and as mentioned, some will actually feed on coral tissue. There's a lot of confusion about who's bad and how bad. For example, the hairy-looking crab *Cymo melanodactylus*, sometimes known as a gorilla crab, is typically thought to be a coral-eating problem crab. In fact, years-old advice is to immediately kill one if you ever see one on a coral in your aquarium.

However, a study by Patton (1994) reported that their stomach contents showed that they feed mainly on coral mucus as well as zooplankton and suspended particles. While they were also observed eating coral tissue, the author stated that the corals seemed "little harmed by this." He also noted that the crabs were often found on coral with dead/dying tissue but that the crabs may have moved to the corals to take advantage of the situation.

Likewise, a more recent study by Pollock, *et al.* (2012) concluded that the crabs were attracted to diseased corals and that the disease advanced more slowly when the crabs were present due to their picking away at affected/dying tissues. These crabs may not be the bad guys they've been made out to be after all and may actually be good for corals in the long run.

In the Aquarium

Regardless, life in a closed aquarium system is quite different from life on a reef, so these crabs may indeed eat away at healthy corals in the home aquarium, even to the point of killing them. Others, like the very hairy *Pilumnus* spp. crabs, most certainly will. The best advice I can give you is to watch closely if you find any crab fooling around on any coral.

You can do an images search on the Internet for coral crabs if you spot one, and there are some great pictures of the common good crabs at www.chucksaddiction.com/coral_crabs.html, as well. If you find that a crab in your aquarium is a trapezid or tetralid, then you have nothing to worry about, but be wary of anything else. All others should be observed as often as possible, especially if they look hairy, and if you see one that is clearly doing damage to the live tissue of the coral it's on, get rid of it.

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■ *Hygrophila pinnatifida* (at top of photo) goes together well with ferns and *Cryptocoryne*. Rasboras look great in such an arrangement.

Takashi Amano

In the Nature Aquarium, a layout is created using a large variety of aquatic plants. If you take a close look at the natural scenery in a forest or grassy field, you can tell that it is composed of various trees and plants. One of the characteristics of nature is that many types of living things are competing with each other in it. The diversity of living organisms helps to stabilize the natural ecosystems.

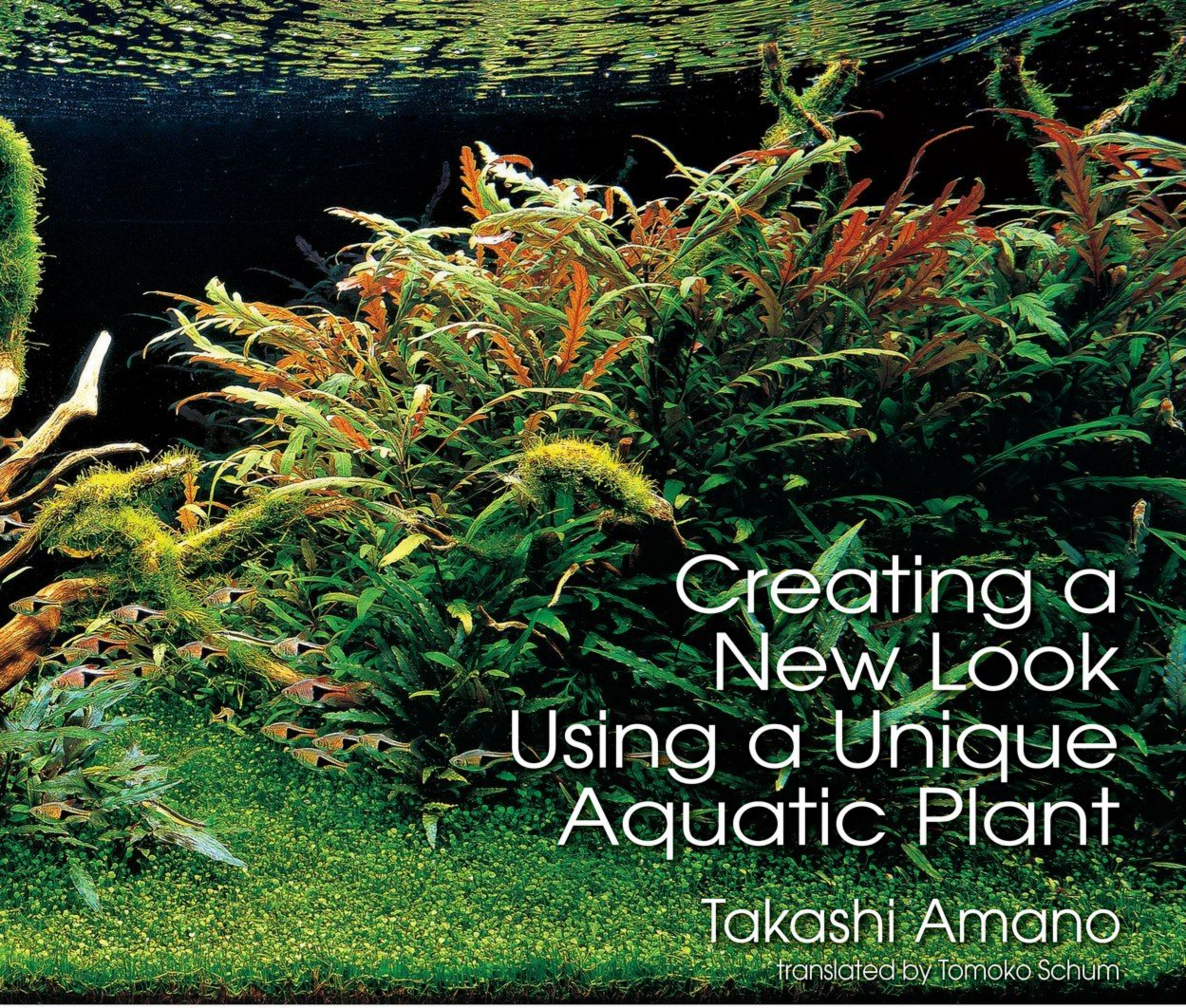
Using a variety of aquatic plants is one of the most effective methods for rendering a natural feel in an aquarium. Since plants often grow in groups of the same type and form a colony, one should not plant a collection of individual plants of various types, even though a variety is good for creating a natural appearance. The basic planting method in the Nature Aquarium is to plant patches of various groups of plants.

Combining Aquatic Plants

When combining aquatic plants, one must keep in mind the characteristics of an individual aquatic plant, such as the size and shape of its leaves, its mature height, its color, and its speed of growth. It is difficult to envision the finished appearance of a layout without knowing these characteristics.

One must also know the basic ecological form, such as sciophytic (shade-loving) or heliophytic (light-loving), to grow healthy aquatic plants, since live aquatic plants attain their beautiful appearance only when they are grown well. Let me explain this point using the layout in this article.

The appearance of this layout right after planting is quite different from the way it appears after the plants have grown in more densely. If different plants are used, the impression of the layout will be different even if the composition is the same. If brightly colored stem plants are used in the background of this U-shaped composition, the impression will be bright and airy. If *Echinodorus angustifolius*



Creating a New Look Using a Unique Aquatic Plant

Takashi Amano

translated by Tomoko Schum

or *Eleocharis vivipara* is used, the layout will have a refreshingly cool impression. On the other hand, if *Cryptocoryne retrospiralis* is used, it will have a more subdued and tranquil impression.

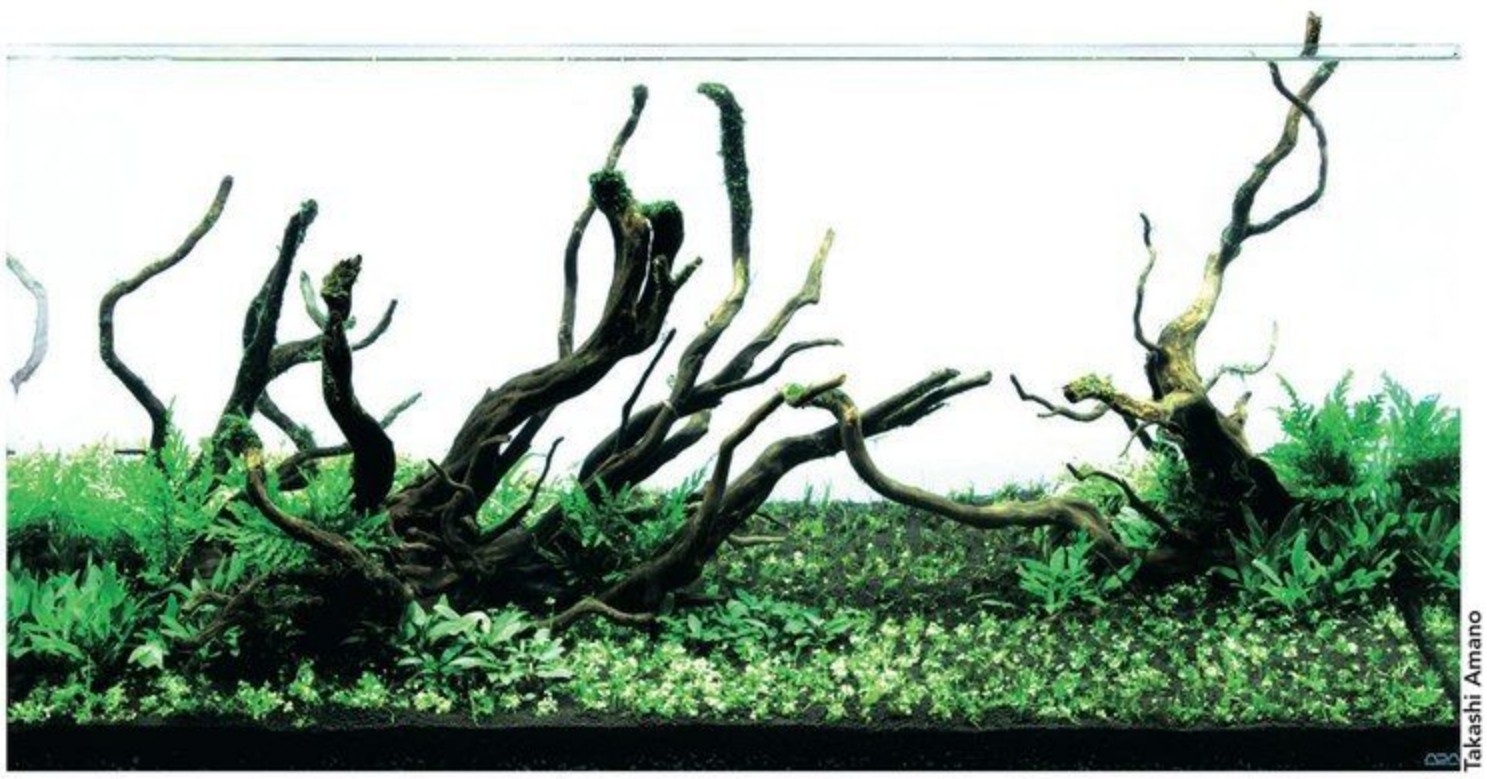
Using *Hygrophila pinnatifida*

In this layout, *Hygrophila pinnatifida* was planted in the background of the U-shaped composition. Although this plant belongs to the genus *Hygrophila*, which is a typical type of stem plant, it has a unique characteristic that is not seen in any other plants in the *Hygrophila* genus. If the planting space is large enough for it to spread, it will grow horizontally and will not become very tall. If planted densely, it will grow more upright and will grow tall like other stem plants.

Additionally, *H. pinnatifida* can attach itself to driftwood and stones. The shape and color of its leaves are also very distinctive. Relatively large *H. pinnatifida* leaves are deeply notched and feather-like, resembling the leaves of ferns, such as *Bolbitis*. The upper side of its leaf is green while the back is reddish brown.

Because of its unique shape and growth forms, *H. pinnatifida* can create a new and different image when used to replace conventional aquatic plants in the same composition.

In this layout, *H. pinnatifida* was used alone in the background, forming a colony of a single plant type, to take full advantage of its unique form. *H. pinnatifida* was densely planted and grew tall. Although a single type of aquatic plant is used, the aquascape appears colorful with both the front and back sides of the leaves showing together. While *H. pinnatifida* has such unique traits, it can render quite a natural feel as well. It seems to go together well with ferns, such as *Bolbitis*, and *Cryptocoryne*. The planting of European clover in the foreground seems to enhance the distinct look of this layout.



Takashi Amano

■ The appearance of the layout right after planting; it has a very different impression from the finished layout with densely growing aquatic plants. It is important to visualize the finished aquascape when planting aquatic plants.

Takashi Amano

■ Planting *H. pinnatifida* in the background can give a totally new impression to a typical U-shaped composition created with branch wood.

Takashi Amano

■ *Cryptocoryne* was planted around the driftwood in the middle ground to hide the lower part of *H. pinnatifida* since the plant tends to lose its leaves on the lower stems.

Takashi Amano

■ European clover was planted in the foreground. This fern with tiny leaves has a different impression from *Glossostigma* or Cuba pearl grass.

DATA

Aquarium: Cube Garden W120 x D45 x H60 cm
Lighting: Solar I (NAG-150W-Green) x 2 units, 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, Penac P, Tourmaline BC
Additives: Brighty K, Green Brighty STEP2
CO_2: Pollen Glass Beetle 40, 4 bubbles per second via CO_2 Beetle Counter (using Tower)
Aeration: For 14 hours after the light is turned off using Lily Pipe P-4
Water Change: ⅓ once a week
Water Quality: Temperature 25°C (77°F), pH 6.8, TH 20 mg/l
Aquatic Plants: *Hygrophila pinnatifida, Cryptocoryne albida, C. petchii, C. wendtii* "brown," *Cryptocoryne wendtii* "green," *Bolbitis heudelotii, Marsilea crenata, Fontinalis antipyretica*
Fish/Invertebrates: *Trigonostigma heteromorpha, Crossocheilus siamensis, Otocinclus* sp., *Caridina japonica*

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

H. pinnatifida grows relatively slowly. As it grows taller, it drops its lower leaves and the density of the leaves decreases. Therefore, the plants should be pulled out after repeated trimmings and rejuvenated by replanting the upper part of the plants. Doing so enables the plant to form a dense bush again. In addition to *H. pinnatifida*, any *Hygrophila* with large leaves, which tend to lose their lower leaves as they grow taller, can be maintained with this method.

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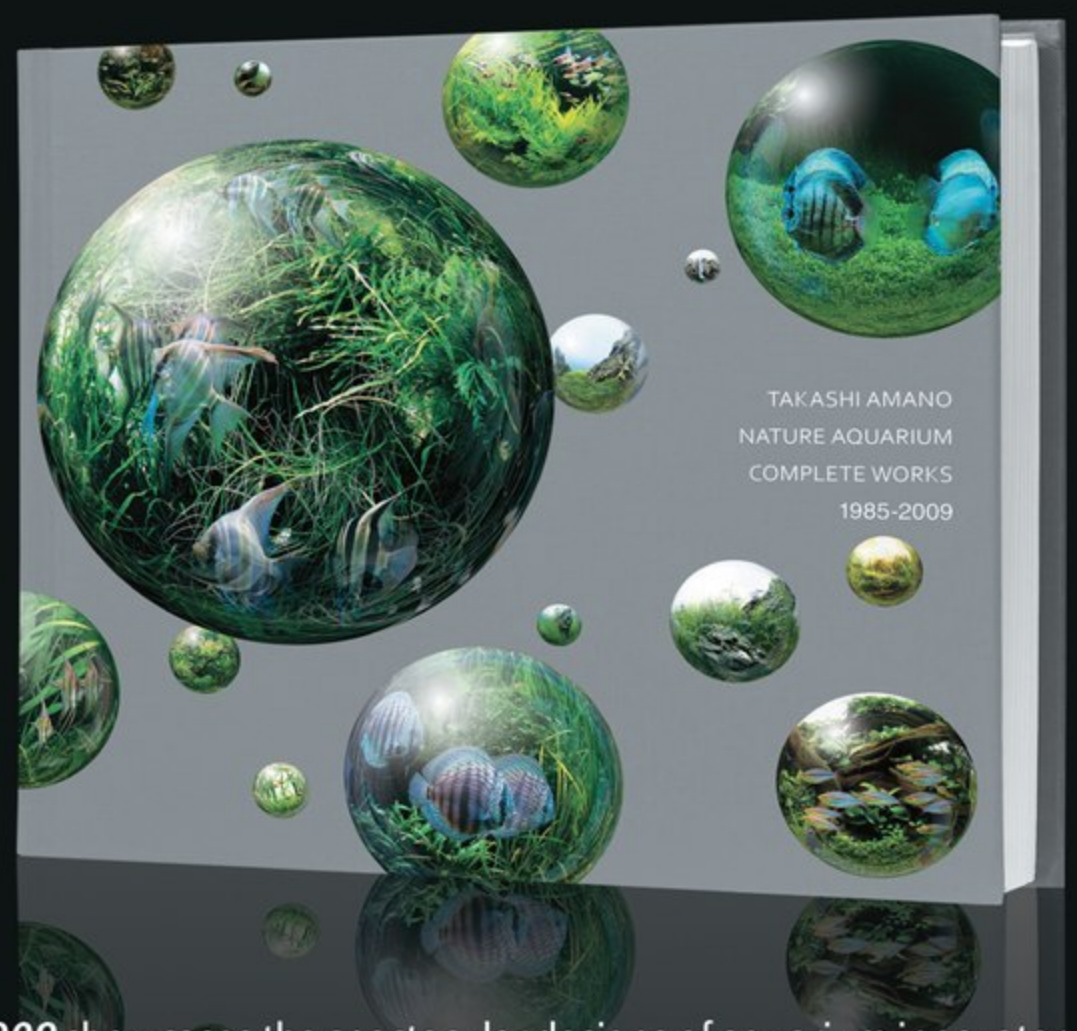

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Takashi Amano
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Breeding the Threadfin Rainbowfish

John Robertson

Aquariumphoto.dk

■ Threadfin rainbowfish (*Iriatherina werneri*).

The threadfin rainbowfish (*Iriatherina werneri*) is a spectacular little fish that does not immediately remind you of the hobby's more common rainbowfishes of the genus *Melanotaenia*. It is smaller and more slender and has an unusual tail-down posture, rather like a penguin characin. When stationary, its colors are pretty rather than gaudy.

Yet the fins of the male threadfin and the flamboyant way it displays these set it apart from all other fishes. Like other rainbows (family Atherinidae), it has two dorsal fins, but again the similarity is limited. The first dorsal is large and rounded. The second dorsal, anal, and ventral fins have huge black filaments that trail behind, somewhat folded like a peacock's tail, but which burst into radiating magnificence when two males meet or when they are courting females.

Beautiful Ballet

Although they seem to hang tail down quite a bit, rather nervously, they are also very active and their majestic displays, with stupendous fins spread to the splitting point, are accompanied by lightning-quick dashes across open water, parallel with their rivals.

Aquariumphoto.dk

■ Threadfin rainbows are known for their constant activity, darting this way and that throughout the aquarium.

In pairs or trios, they display to each other with sudden twists and turns coordinated to fractions of a second, their glorious filaments exploding into view, then folding instantly, then displaying again just as quickly. Constantly unpredictable, starting, stopping, diving this way and that, it is literally an underwater ballet.

Not only is this one of the most enchanting displays available in the hobby, but it is also given freely. Kept in a small group with other small and inoffensive fishes, the threadfin rainbow is always displaying. This remarkable show is seen every day. The aquarium is always full of life, with action bursting in all directions.

Like birds of paradise, appropriately, the threadfin rainbow hails from central to southern New Guinea and also from northern Australia. Including fins and a sickle-shaped tail, the male reaches about 2 inches long and the females rather shorter. The body is torpedo shaped with a pointed snout and small mouth.

The base color of the threadfin is gray with a bright golden eye and operculum, but the tiny scales are reflective, gleaming with blue, gold, and green as they dash about. In breeding condition, the male's belly is orange and his lips black. His fins become reddish, and the anterior dorsal and curvy tail show edges of blue. A pale stripe along the back and down the forehead appears metallic green or bluish gray from different angles. This rainbow of color contrasts with the jet black of those enormous trailing rays of the unpaired fins.

I bought 14 young fish and housed them in a 16-gallon tank. It was densely furnished with Java moss and other plants at both ends, but I left plenty of swimming space in the center to fully appreciate the energy of the fishes. I kept them in rain water at about 80°F and fed them mainly baby brine shrimp. I mentioned the small mouth. They will eat other foods, including a little flake, but even adults struggle with all but the smallest of bloodworms or mosquito larvae.

No Girls Allowed!

With regular water changes, the threadfins developed quickly, and it was not long before I was convinced they were spawning. With constant displaying and couples diving into the Java moss, I waited patiently for fry, but none appeared. I removed them to another tank, but no fry resulted. I tried a variety of things for over a year until I realized I was missing something fundamental—females!

I laugh about it now because it's quite easy to determine gender in this species. The girls are smaller and lack the extravagant fins. In my group of 14, I had only two that I thought were females because their filaments were shorter and less dark. After months without success, I was suspicious. Then I read that it is common to find single-sex groups in dealers' tanks! Perhaps the commercial breeders deliberately supply them that way to discourage home breeding.

John Robertson

■ Male threadfin rainbowfish can be recognized by their long fin filaments and bright colors.

After some months of searching, I found a group of females and purchased four. I placed them in a separate tank to condition them, thinking the ardent attentions of 16 long-frustrated males may have been too much too soon. Two weeks later, I placed two males and two females each in two 16-gallon tanks set up as I described above but with woolen mops also added to the tank ends, high in the water.

To my surprise, there was not much frenzy. I had expected amazing displays of those huge fins, corralling the females towards the mops, but it seemed to be a quieter affair. Maybe this was because the adult males were getting rather old or because the real fireworks are reserved for rival males, as I had seen so many times before. Maybe I just missed the best of it when I was at work all day. Anyway, after a few days, I saw males sensually quivering among the mops and plants, filaments folded back, heads pointing rather up or down. This tempted the females in, and spawning took place in a rather gentle fashion.

The Tiniest of Fry

In only two weeks, a few tiny fry were spotted on the water surface, but they did not survive with the adults. I removed the woolen mops to a 12-inch tank with water from the breeding tank, and every day or so, a few more free-swimming fry would appear. I changed water twice a week, replacing with water from the parents' tank.

They are among the tiniest fry I have seen and reputedly have the smallest of mouths. My research revealed that success requires feeding with microscopic foods in early stages. I started with green water from my wife's greenhouse and the smallest of powdered foods (5 to 20 micron) until the fourth day when I added paramecia. I continued to feed this diet until the first young were 10 days old, when I replaced the green water with newly hatched brine shrimp. Only the largest of the fry showed any interest in the nauplii. They were three weeks old before I was sure they were all eating the brine shrimp, and at that time, I counted 18 fry.

Until the fry were five weeks old, they always seemed more excited by paramecia than by brine shrimp. The numbers of fry dwindled, though, and I finally raised only eight young from this brood and a further eight from a second group.

When the fry were five weeks old, I wrote to a friend that they were beginning to look like little glassy rainbowfish (rather like Popondetta). The largest ones had begun to hang diagonally, tail down as the adults do, but they did not have the pointed snout yet. At that stage, they are rather the size of newly born guppies.

From that point, they grew quickly and started to look like females at about seven weeks. The male fin extensions began to develop at 12 weeks, but the sexes were not easily distinguished for several weeks more.

The threadfin rainbowfish is not the easiest fish to breed, but it is one of the most remarkable and rewarding small fish to keep in a group with other small and inoffensive fishes. If they are given space to demonstrate their amazing frenetic dances and display their stupendous fins, you can expect to witness one of nature's most wonderful performances. After over 40 years in this hobby, I cannot think of anything more spectacular that the fish world could offer the owner of a 16-gallon aquarium!

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Sawbwa resplendens / photo by Takashi Amano

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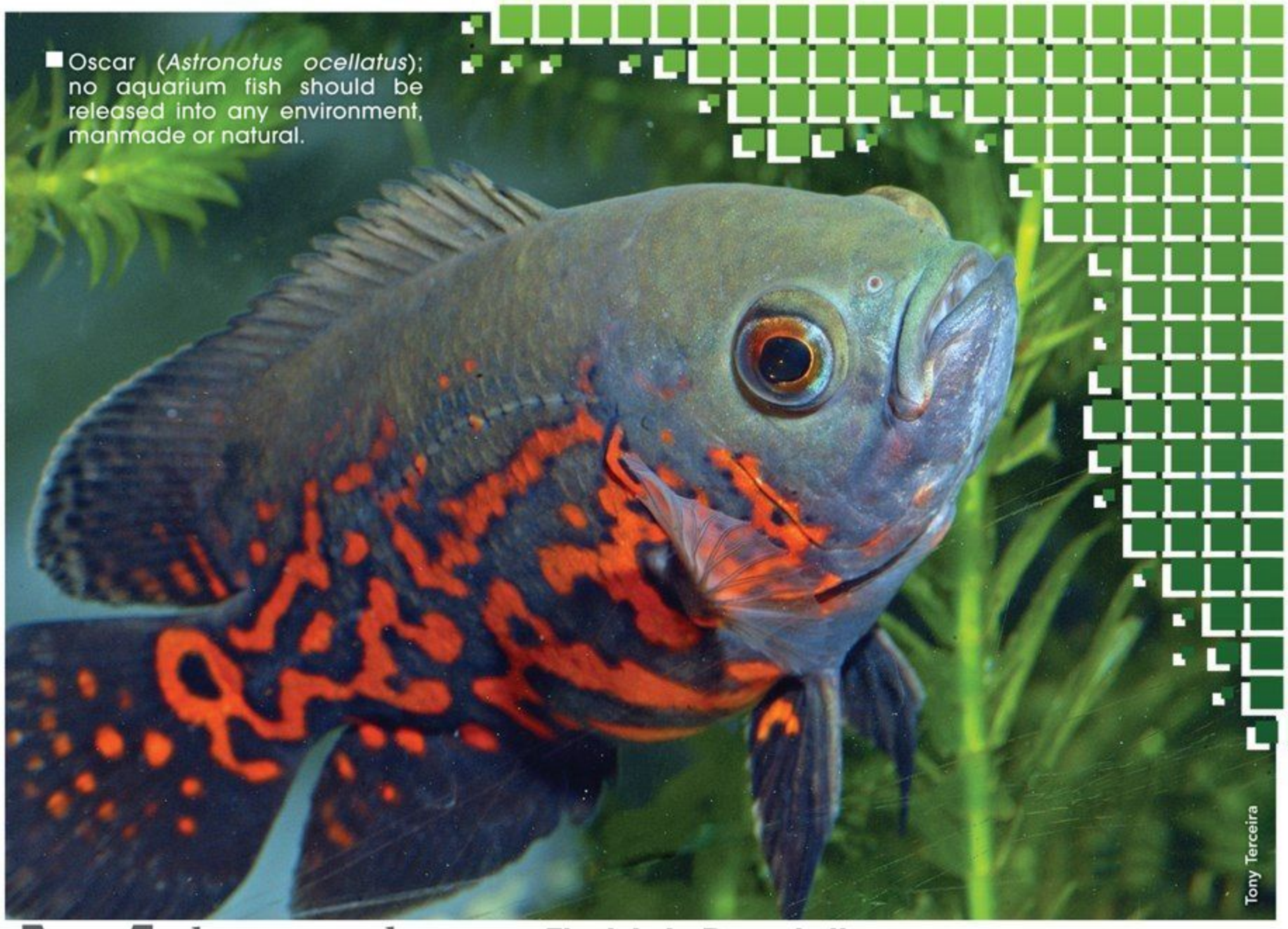
Florida's Exotic Freshwater Fishes

Charles A. Nunziata



■ Oscar (*Astronotus ocellatus*); no aquarium fish should be released into any environment, manmade or natural.

Tony Terceira

Moderate weather and copious water resources have made Florida a hotspot for thriving populations of exotic tropical, semitropical, and North American native freshwater fish. And although many of the exotic fishes now swimming in Florida waters are available through aquarium shops, hobbyists are often fascinated by the process of finding and catching these species in the wild.

A common definition of "exotic" is any animal or plant living outside captivity in a place that it does not historically inhabit. Most exotics, both plant and animal, have been introduced by human activity, and most have not to date significantly damaged the ecology. However, the potential to outcompete native species through high rates of reproduction, aggressiveness, or environmental resiliency is ever present. Because of the potential for damage to the native ecosystem, significant state regulations regarding the release, importation, transportation, and possession of exotic fishes have been developed over the last 40 years.

Florida's Regulations

In Florida, the primary determinant of an exotic's range is its tolerance to water temperatures. Most of the common tropical exotics are restricted to the warmer southern regions of the state, with the southeast region being ground zero in terms of the number and diversity of exotic species established in the United States.

The Florida Fish and Wildlife Conservation Commission (FWC) classifies non-native species into categories to which specific rules and regulations apply. These are generically referred to as "listed species," and it is illegal to possess a listed species without a permit. It is also illegal to import or transport across state lines any listed exotic.

Regardless of whether an exotic species is listed or not, it is illegal to release any nonnative species in Florida waters without a permit. Hobbyists should never release fish they no longer want into any environment, manmade or natural.

Listed species are categorized as "Conditional or Prohibited Nonnative Wildlife." The difference between these is based on the degree of danger they are thought to present: Prohibited species have been determined by the state to be dangerous to the ecology and/or the health and welfare of the people of Florida, while conditional species are suspected, but not proven, to be dangerous.

FWC also defines the status of nonnative species in the wild and whether they are considered invasive. An invasive species is one that is expanding its range and causing ecological problems by negatively impacting native species.

Besides the official FWC database, there is another, somewhat-less-reliable database that lists the exotic fishes in Florida, the Nonindigenous Aquatic Species (NAS). This database is an arm of the United States Geological Survey and cautions that accuracy is not guaranteed and some data may be outdated. Therefore, only recent-year data was used.

Florida has become much more active and effective in controlling exotics over the last few decades. Compared to a 2003 review, FWC reports that the number of extirpations

has increased while the total number of exotic species has declined. Even so, the number of permanent species increased slightly from 21 to 25 over the 2003–2013 period and several other species are currently expanding their ranges, especially into the Everglades system.

The following review is limited to aquarium-appropriate species most likely to be encountered when collecting in Florida. Also included are large species whose juveniles are attractive and likely to be mistakenly taken home.

Catfishes

Most of the exotic catfish in Florida of interest to hobbyists are the suckermouths of the family Loricariidae: Five suckermouth catfishes are in multiple and widespread locations defined by the FWC and NAS databases. These databases are not in agreement, however, and this is attributed to somewhat error-prone identifications of these similar species. All eventually reach 20 inches or more in length, larger than most aquarists can accommodate.

Pterygoplichthys anisitsi

The snow-king pleco is listed by NAS, but not FWC. It is established in central to northeast Florida, in the Upper and Lower St. Johns drainage, the Silver River, and the northern inflows to Lake Okeechobee.

Pterygoplichthys multiradiatus

The sailfin pleco is the most successful and common suckermouth in its range. It occupies nearly any type of slow-moving water course. They prefer shallows near the banks into which they typically burrow. This undermining propensity can be destructive to the shoreline structures. They can be found in any river system throughout central and south Florida.

Pterygoplichthys disjunctivus

The vermiculated sailfin catfish is sporadically found over an enormous swath of central Florida and is particularly common in most waters in Hillsborough County, where it was reported as early as 1971. It appears to be slowly expanding throughout its range.

Hypostomus sp.

The species of *Hypostomus* found in Florida is not definitively identified by Florida authorities. Although this species was probably the first suckermouth introduced to Florida in 1958, it is not at all widespread. It is found in what appear to be unconnected, far-flung, and isolated locations, including Miami-Dade in the south, Titusville on the northeast coast, and in mid-western Hillsborough County, each hundreds of miles apart. The USGS identifies a few sites where *Hypostomus plecostomus* was collected and one where it is thought to be established. It is unknown whether this is the same as the reported *Hypostomus* species.

Tony Terceira

■ Among the more common invasive fish, some loricariid catfish have been successful in Floridian waters.

Lmnopg007/Shutterstock

■ Severum populations seem to be limited to south Florida.

Pterygoplichthys pardalis

Also not listed by FWC, this suckermouth is reported by NAS as established in Desoto, Hardee, and Okeechobee counties through south central Florida, and west to Sarasota.

To round out the suckermouths, NAS reports one population of bristlenosed catfish (*Ancistrus* species) established in the Tamiami canal in Miami-Dade.

One non-suckermouth of note is *Hoplosternum littorale*, the brown hoplo, a bony armored catfish that grows to 10 inches and inhabits the muddy bottoms of slow-moving water courses across central Florida to the east coast and south to Miami-Dade. This species gulps air and can survive in low-oxygen conditions. Interestingly, it is a bubblenest builder and the male guards fry. They tend to be quiet and unobtrusive aquarium residents if kept in large-enough tanks.

Cichlids

Many cichlids of interest are established in Florida, including a number that have established permanent populations and others that appear to be on their way to that status.

Black Acara (*Cichlasoma bimaculatum*)

Sometimes referred to as the port cichlid,

this species has been in Florida since the early 1960s and is now found in hundreds of fresh or stagnant roadside ditches and ponds. This species is established in most of the southern counties of Florida and as far north as Hillsboro County in the Tampa Bay area.

The Banded Cichlid (*Heros severus* or Possibly *Heros efasciatus*)

The common "severum" is not considered to have established a stable population. Banded cichlid populations appear to be limited to south Florida, Miami-Dade, in the Snapper Creek and Tamiami canal systems.

Butterfly Peacock (*Cichla ocellaris*)

A large species introduced by FWC as a game fish in 1984 but reported in the southeast coastal canals as early as the 1960s, the butterfly peacock prefers the shady area of slow-moving water courses. Its inability to withstand low temperatures limits its range to coastal canal systems in Miami-Dade, Broward, and Collier counties.

Jaguar Guapote (*Parachromis managuensis*)

The jaguar guapote is a foot-long fish that is spectacularly patterned and sports a toothy, protruding mouth. It is an imposing and interesting fish for the specialist. Commonly found in the canal systems that interlace southeast Florida, it has progressed west into Collier County but only as far north as West Palm Beach. Juveniles are attractive and are often taken home by people not knowing their ultimate size.

African Jewelfish (*Hemichromis letourneuxi*)

Previously known as *Hemichromis bimaculatus sahara,* the African jewelfish (*Hemichromis letourneuxi*) is a close relative of *H. bimaculatus*, the well known jewel cichlid. Breeding males are colored an intense and velvet red, suffused with pearly spots. Non-breeding males have a red abdomen with dusky flanks and back. This author caught such a spectacular specimen in a lake near Davie, Florida.

For all its beauty, this is an aggressive fish that is thought to negatively impact native fish populations, especially those of the dollar sunfish (*Lepomis marginatus*). Although established in Florida for about 60 years, *H. letourneuxi* remained relatively contained to the Miami area canal system and the region around the Miami International

Tony Terceira

The African jewelfish is thought to be capable of out-competing native fish in Florida.

Airport. However, a recent burst of expansion into Dade County, Monroe County, the Everglades, and Big Cypress National Park has heightened concern about its future impact on native species. It is relatively cold tolerant as evidenced by the establishment of sporadic populations as far north as Hillsborough County and west to Charlotte Harbor.

Mayan Cichlid (*Cichlasoma urophthalmus*)

The Mayan cichlid (*Cichlasoma urophthalmus*) is an adaptable sunfish look-alike that can reach 8 inches in aquaria. Many specimens are drab, but some can be quite colorful. It has successfully established hundreds of populations in south Florida, Lake Okeechobee, St. Lucie Canal, Taylor's Flow, northeastern Florida Bay, and many sites in the Everglades. It can adapt to almost any environment and is found in every type of water course throughout its range. Mayan cichlids are euryhaline, inhabiting freshwater, estuarine, and marine regions. Their tolerance of low temperatures makes their continual expansion a virtual certainty.

Midas Cichlid (*Amphilophus citrinellus*)

Similar to the Mayan cichlid, but a bit larger in aquaria, the Midas cichlid has some similarity to the native bluegill (*Lepomis macrochirus*). In somewhat of a role reversal, the Midas cichlid gets more colorful as it matures. The vast majority of full adults exhibit bright colors and interesting patterns. This species is common in all the southern counties but has failed to winter over in colder mid-Florida regions around Tampa and Gainesville.

Eastern Happy (*Astatotilapia calliptera*)

Another cichlid listed on the NAS, the eastern happy (*Astatotilapia calliptera*) is a Malawi cichlid that has been found only in the Hillsborough Canal in Palm Beach County where it prefers heavily vegetated regions. This canal is part of the Everglades drainage.

Oscar (*Astronotus ocellatus*)

Although a favorite target of fishermen in south Florida, where they average a robust 10 inches, the oscar is not a regulated game fish. This popular aquarium fish is commonly found throughout the water-conservation areas and Everglades habitats of Collier, western Miami-Dade, Broward, Henry, Glades, and Palm Beach counties. It prefers canals that cut through marshy areas and is less common in the coastal canals.

Redstriped Eartheater (*Geophagus surinamensis*)

The redstriped eartheater (*Geophagus surinamensis*) has been established in the Snapper Creek Canal, Miami-Dade County, since 1982 and is probably limited there. It has been collected from other canals west of Latana, Palm Beach County as well, but not since 1974.

Yellowbelly Cichlid (*Cichlasoma salvini*)

The yellowbelly cichlid (*Cichlasoma salvini*) is a popular and beautiful aquarium fish that is well established throughout much of southern Broward County and is currently spreading into the Everglades system. It is an adaptable species that is comfortable in all types of aquatic habitats. At up to 5 inches, this is an impressive cichlid. Most collecting sites are in Broward County with one reported at the Everglades Conservation Area No. 3 in Miami-Dade.

Miscellaneous Species

A number of other species have established populations throughout southern Florida.

Swamp Eel (*Monopterus albus*)

The swamp eel inhabits shallow, slow-moving or stagnant water. It has the ability to survive long dry periods by burrowing in the mud and breathing air when the water disappears. It is commonly found in canals and creeks throughout its range and is quite common in the Little Manatee River and Bullfrog Creek drainages near Tampa. This species is expected to continue to spread throughout central Florida and south. It will typically grow to 12 inches or larger in aquaria.

Spotfin Spiny Eel (*Macrognathus siamensis*)

The spotfin spiny eel (*Macrognathus*

siamensis) is an elongated eel-like Asian native that is a very recent addition to Florida waters. Reported as established by NAS, but not FWC, it is found in more than 30 sites in Everglades National Park.

Pike Killifish (*Belonesox belizanus*)

The pike killifish (*Belonesox belizanus*) is a predatory surface dweller whose natural range includes the Atlantic drainages from Mexico to Guatemala and Costa Rica. It is most common throughout Dade, Collier, and Monroe counties and parts of the Everglades National Park system. It has been reported as far north as the Tampa Bay area. Interestingly, NAS reports that the pike killifish most likely was introduced in 1957 when specimens maintained for medical research in south Florida were released into a local canal. Young are very interesting, but this predator is only for the specialist.

Clown Knifefish (*Chitala chitala*)

The clown knifefish (*Chitala chitala*) is a 1994 addition to the Florida environment. It is often seen in aquarium stores as a juvenile, but this is a large fish that can reach well over a foot in aquaria. It is currently limited to the vast canal system in Palm Beach County, Lake Osborne and Lake Ida, and connected water resources in southeast Florida. It is thought that temperature sensitivity will keep the species contained in the southern regions.

Metynnis sp.

Metynnis sp. is reported by NAS, but not FWC, as locally established at several sites in the Regional Park Conservation Area in Halpatiokee, near Stuart, central east coast.

Tony Terceira

■ The spiny eel is now found in several sites throughout the Everglades.

Variable Platyfish (*Xiphophorus variatus*)

Reported to be locally established as long ago as 1967, and sporadically reconfirmed over the years, the latest in 2011, *Xiphophorus variatus* is a popular Mexican native that is now established in Alachua and Hillsborough counties.

Native North American Fishes Exotic to Florida

A number of North American native species have been introduced into Florida waters.

The orangespotted sunfish (*Lepomis humilis*) is a pretty, moderately sized, aquarium-friendly sunfish that is native to much of the mid-section of the US. This beauty is thought to have been accidentally introduced with sport fish to the Apalachicola River system where it can be found today.

Herichthys cyanoguttatus, known as the Texas cichlid, is a North American native species that naturally occurs in the lower Rio Grande drainage. It was reported in Florida as early as the 1940s, and the first permanent population was recorded in Tampa in 1958. This large, aggressive, and quite beautiful cichlid mainly occurs in larger springs and spring outflows with favorable water temperatures. There are several isolated populations in Hillsboro in the Tampa Bay area and as far south as Dade County. They do not appear to be extending their distribution, nor have they consolidated populations into a contiguous range.

Notropis baileyi, the rough shiner, and *N. harperi*, the redeye chub, are native to Alabama and Mississippi. The rough shiner is now found in the Escambia River drainage and the redeye in the regions around Tallahassee. Both are thought to have been introduced through bail bucket releases. These attractive and active shiners are well suited to the aquarium.

A number of large native catfish have been established for decades in Florida. Although these are much too large for the aquarium, cute-looking fry are sometimes taken home to the eventual dismay of the collector. The young of these species look very different from the native catfish of the genus *Noturus*, so it is easy to avoid making this error. The major river systems in the western panhandle are home to the blue catfish (*Ictalurus furcatus*), a large catfish native to a huge swath of the US, from Texas to the Dakotas. Also found there is the less common flathead catfish (*Pylodictis olivaris*) native to the central third of North America.

Conditional and Prohibited Species

Several listed species are likely to be encountered by the collector, and accidental possession does not relieve responsibility under the law.

Clarias batrachus, the walking catfish, was the subject of media hysteria many years ago. Although established in fresh and brackish waters throughout central and southern Florida, the walking catfish has not destroyed the ecology as originally feared. It seems that Florida's fish-eating birds have a taste for exotic catfish and contribute to keeping this species from inundating the aquatic environment.

Florida has made illegal the possession and transport of virtually all species of live tilapia without a permit. However, there is a special exception for listed species that are suitable for human consumption.

Tilapia likely to be encountered in Florida waters include the most common cichlid in south Florida, the spotted tilapia (*Tilapia mariae*) and *Sarotherodon* (*Tilapia*) *melanotheron*, the nearly as common blackchin tilapia. One will also encounter the cultured food fish the blue tilapia (*Oreochromis aureus*) and three of the less common tilapia of the genus *Oreochromis*: the

Tony Terceira

■ Silver dollars can be found in Florida.

Wami tilapia (*O. urolepis*) the Mozambique tilapia (*O. mossambicus*), and the Nile tilapia (*O. niloticus*).

The bullseye snakehead (*Channa marulius*) is an air-breathing fish that looks very much like the native bowfin (*Amia calva*). It is difficult to determine whether a particular specimen is a snakehead or a bowfin, with the long anal fin of *C. marulius* being the most distinguishing feature. Their range is limited to the southwest east coast region around Coral Springs and Pompano Beach to Ft. Lauderdale.

Lepomis cyanellus, the green sunfish, is a large, predatory sunfish that is native to the mid North American continent, but not to Florida where it has been established in a few sites in Union County, north central region, and in the Apalachicola and other panhandle drainages.

Continued Vigilance Needed

The exotic fishes in Florida represent an enormous array of genera and species, many permanently established and some on their way to permanency. However, the situation could be much worse. We could be inundated with explosive and unmanageable species that significantly reduce native populations. At this stage, that does not appear to be the case, although we have several candidate species that could significantly erode our natural fish ecology in the future.

Most exotics have found a niche and have not significantly altered our aquatic populations. It is heartening that the number of permanent populations has not greatly increased over the last 10 years, that the number of exotic species eliminated continues to grow, and that no native populations have been significantly damaged by exotic fishes. With continued vigilance, our altered environment will continue to represent all the essentials of the pre-exotic environment. That is certainly a worthy and necessary goal.

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■ Getting large specimens, like this ex-*Cichlasoma pearsei*, to grow to full potential takes a large tank along with frequent water changes and excellent filtration.

Fish as Family Pets

Jeffrey W. Hiser II

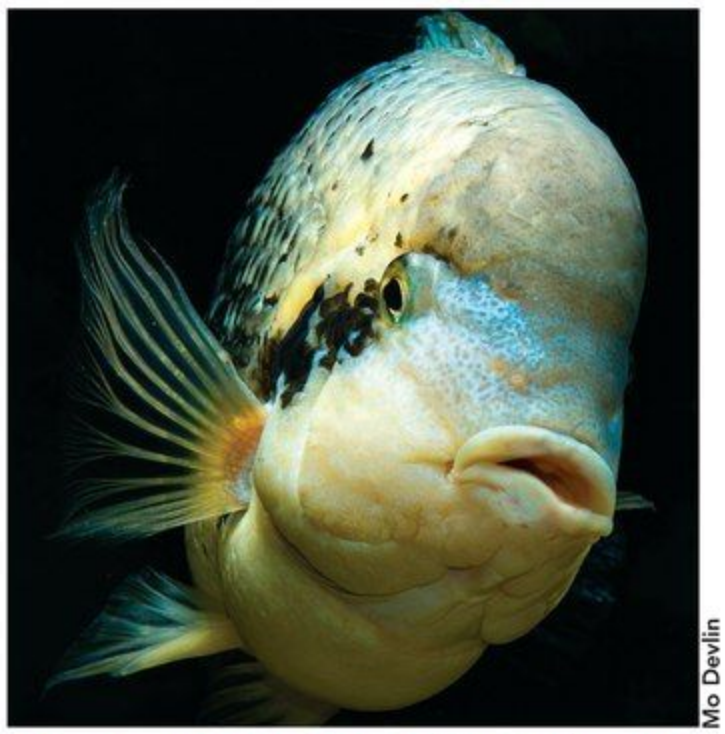
We all enjoy sitting in our fishrooms or in front of our tank, watching and observing the fruits of our hard work. That relaxing feeling of watching our pets interact with each other justifies the countless water changes, endless gravel vacs, and tiring job of scrubbing algae off the front glass. Some of us keep little fish and some big, but the fish in this article are special in that they are truly interactive pets and will respond to you.

Central and South American cichlids have been a mainstay in my fishroom for many years, and about three years ago, they became the only fish I keep. Currently, I have several species of cichlids in my fishroom, including *Parachromis dovii, P. managuensis, P. friedrichsthalii, Amphilophus labiatus,* and *Caquetaia umbrifera.* The fascination with these types of big fish started when I found that you can train them to be truly interactive pets, or what I like to call "water dogs." Now, these fish may not fetch your morning paper, go on a late-night jog, or even snuggle with you when it's cold outside, but these types of cichlids, among others, can and will be great companions if cared for and interacted with on a daily basis, and may even train you to their liking.

Keeping Central and South American Cichlids

Some may think that keeping these types of fish is harder than keeping the more common goldfish or other smaller fish. Keeping Central and South American cichlids is not any more difficult than keeping a beginner-type fish in that you just have to do your homework and really prepare yourself for the journey of cichlid keeping.

There are three important factors that must be addressed when embarking on this journey. First, and probably most important, is the size of tank you have or can afford to get. These fish get very large and produce copious amounts of waste. Say, for example, you are starting out with the ever-so-popular 55-gallon aquarium. This tank size is a great start, especially if you are starting out with a baby or juvenile fish. However, it will not be sufficient for keeping the majority of these large cichlids for life. A good rule of thumb when selecting a tank to start with is bigger is always better. If you start out with the largest tank your budget allows, then you will run into fewer problems down the road. Not to mention, your water parameters will be more stable in a larger body of water, making your experience more forgiving. Remember that only bad things happen quickly in this hobby and patience is always a virtue.



Mo Devlin

Paratheraps zonatus; large fish often become much like puppies, begging for food.

Jeffrey Hiser

The author used food to train his fish, and now they try to get his attention whenever he is in the fishroom.

Second is the filtration provided for your new water pet. Over filtering is a must with these big boys. Just as is true with the aquarium, bigger is always better when it comes to the filtration for these fish. If you're starting out with a 120-gallon tank, try getting a filter rated for at least double that number of gallons, with a rating of five times that volume being optimum.

Lastly, dedication is needed to keep these fish healthy. They can be very messy eaters and produce a ton of waste in that process. The best way to combat this is by having a regular schedule for water changes and filter maintenance. The closer you can get to large, non-stop water changes, the better. Of course, having a large system will help keep the parameters in the appropriate range.

Performing large, 60 to 80 percent, water changes every week has done wonders in my fishroom for many years. This will give your cichlids a great environment to grow and live in as well as help them reach their full potential and beauty in your care.

Interacting with your Cichlids

When casually talking with people about my hobby, I get a lot of funny looks when I say that interacting with and training your fish creates a bond between you and the fish that is comparable to the bond between a human and a dog. Training your fish is not the same as training your dog, but the concept is the same.

However, as with training a dog, cichlids can and will teach you a few things too. Spend time with them and work with them in a way that gets them used to seeing and hearing you, and you'll be amazed at the intelligence these fish possess. Fish, especially cichlids, are very complex organisms. They can hear, smell, and taste just like any other animal, except when they use any of these sensory organs, it happens much faster and is a lot more pronounced in their underwater world.

Consider what happens at feeding time, for example. As soon as you drop the food in the water, they immediately swim to the food and start eating. Have you ever

Mo Devlin

■ Even during periods of stress, large Central and South American cichlids can give attitude; this *Nandopsis haitiensis* lives up to his common name, the black nasty, by showing an angry flare while being judged at a fish show.

wondered how that pleco that hides all the time knows there is food in the water? Sense of smell in water for fish is almost immediate. Even in a large system, all the fish can smell food within a second of it hitting the water surface. Sound also travels much faster in water than on land. The pleco hiding under that piece of driftwood or rock hears the vibrations of the other fish splashing about, eating their dinner much like piranha hear the vibrations of a distressed fish. You can use those exceptional senses to your advantage when training cichlids.

Of course, when you first bring your new cichlid home and get it acclimated, it will likely be stressed and timid. You want to give your fish at least 24 to 48 hours to settle in and get acquainted with its new surroundings before you start trying to work with it. After this time, or if your cichlid has been in its home for a while already, it's time to get to work building your friendship.

Using Food to Train

Start off by spending more time feeding your new friend. Feeding your fish is one of the more important steps in creating your companionship with cichlids. Food is the universal language for every living thing. Instead of just getting a scoop of food out of the bag and dropping it in the water for a free for all, try getting your cichlids' attention by showing the food through the front glass of the tank. Once you see them look at the pinch of food, slowly take it up the glass, eventually dropping it in the tank. Doing this sounds silly, I know, but it shows your cichlids that you personally have the food and are putting it in the tank.

Mo Devlin

■ One of the most interactive periods for a female *Parachromis managuensis* is when she is protecting her fry. During this period, she responds to people in front of her tank as she would a threat in the wild—with protective aggression.

Just like the stray dog you've been feeding on your porch, they see you bringing the food out to them, so they associate that location and you with a full stomach, which keeps bringing them back. Doing this with your cichlids is the same concept. They associate you being close to their tank with getting fed. This way, they will start coming up to the front of the tank whenever you're close instead of hiding out near the back.

If you feed live food, this training is going to be very different. First, you have to be careful when feeding live food because there is a huge risk of introducing disease to your fish, unless you raise your own. It's also important to offer live foods in moderation—once or twice a month will give your companion the thrill of the hunt as well as provide the nutrition it needs (as long as the feeders are not diseased and are gut loaded with a nutritious cichlid-based diet).

When feeding with this method, the idea of showing them that you are the one with the food still applies. You will also notice an intense and vibrant change in your cichlids' color during a live feeding. This is because live food puts your fish into a state of excitement and natural instincts start to kick in. Watching your fish hunt and find their prey is as close to witnessing natural feeding behavior as you can get short of actually observing them in the wild.

Now, some fish could care less where you are around their tank; they are just in-your-face types of fish. This eliminates one step in training because they are not shy and their territory probably extends well beyond their tank walls. My breeding pair of *P. managuensis* was like this when they were young; it took a lot less time to get them to the point of being personable.

With this first step, patience is a virtue because every single cichlid (or fish for that matter) has its own unique personality and thought process—even within the same species, such as my group of *C. umbrifera*. Spending more time with your fish during feeding will help you get a feel for how each one reacts to your presence and will help them get a feel for you as well.

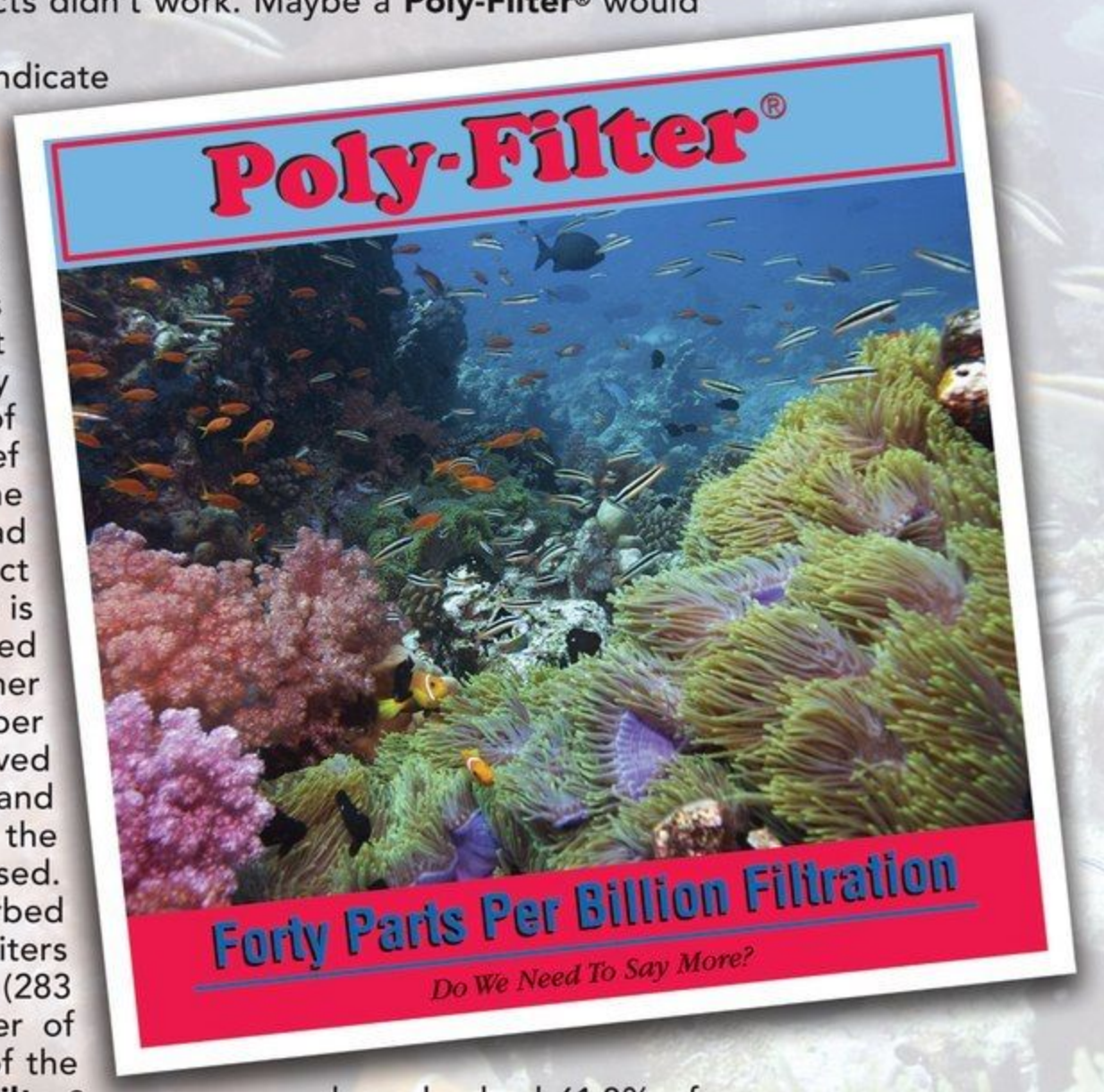
During this time, your cichlids will start their training process with you too. Whether they are more timid or more outgoing than others in the tank will determine how long you spend in front of the aquarium during feeding time. Once your new water dogs get used to you being close to their tank, then it's time for the real fun to start.

The Training Begins

There are many ways you can go about training your cichlids, but for the sake of simplicity, I will talk about only a few. One great and really old way is what I call mirror training. This tried-and-true method works wonders with these types

Rescued Reef Aquaria

Poly-Filter® has rescued tens of thousands of freshwater, brackish, saltwater and reef aquaria during the past Thirty-Five years. During December 2011 alone we received ten emails, from experienced reef aquarists, all asking about the blue coloration adsorbed into **Poly-Filter®**. These long term, reef aquarists had not been previously using **Poly-Filter®**. Instead they had chosen: activated carbon, activated carbon and ion exchange resins, macro reticulated styrene adsorbents and other sorbent media. However, when problems with the corals developed each had decided these other filtration products didn't work. Maybe a **Poly-Filter®** would solve the problem?



The unique, Patented color change in **Poly-Filter®** appeared to indicate copper being adsorbed. How could this happen? Each of these aquarists had been treating tap water using low pressure reverse osmosis and mix bed deionization. We explained that if the mixed bed D. I. resins failed copper would certainly enter the aquaria. Could ten very experienced reef aquarists, all having mix bed resins fail? It is certainly possible, low pressure reverse osmosis will bypass sufficient copper that it would negatively impact corals. However, we suspected additional copper and other heavy metals, so inquiry was made about amount, frequency and types of water treatments and/or coral "additives" being used. Every reef aquarist had been dosing: calcium, magnesium, strontium, iodine /iodide, carbonates and trace elements. Would copper, iron, lead be trace contaminates found in these additives? It is a scientific fact that lead is the major contaminate in all calcium compounds! Iron is another almost a universal contaminate. Copper may have entered aquaria as a trace contaminate found in the trace elements or other coral additives? However when **Poly-Filter®** adsorbed the copper it would also adsorbed: iron, lead, excess heavy metals, dissolved organics, phosphates, volatile organic chemicals, pesticides and any biotoxins. Water quality was corrected, aquarists reduced the amount of additives and the clarity of their aquaria greatly increased. Coral health and growth problems solved! **Poly-Filter®** adsorbed 31.97% of 718.95 micrograms per liter ionic copper @ 14.307 liters per minute within seventeen seconds. Activated carbon/resins (283 grams) adsorbed only 20% of the 718.95 micrograms per liter of copper but needed 30 seconds. Zeolite resin adsorbed 14.5% of the 718.95 micrograms per liter of copper within 17 seconds. **Poly-Filter®** also adsorbed 61.8% of 211 micrograms per liter within 60 seconds at 14.307 liters per minute out of saltwater. **Poly-Filter®** adsorbed 46.4 % of 1570.2 micrograms per liter of chelated copper @ 14.307 liters per minute within 14 minutes. A strong chelating resin (1000 ml.) could only adsorb 13.03 % of 1570 micrograms per liter @ 14.307 liters per minute within 14 minutes.

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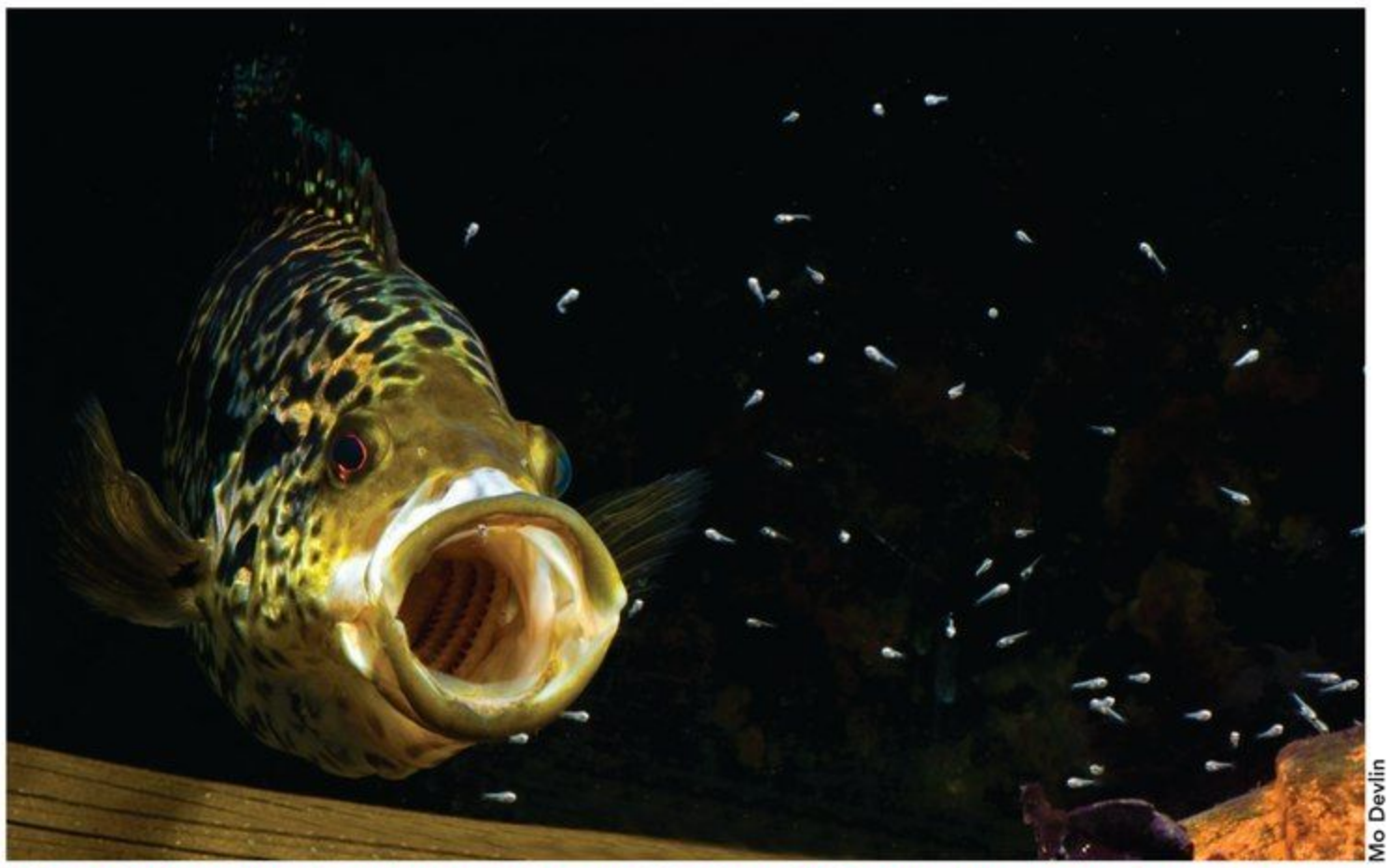

Mo Devlin

■ Female *Parachromis managuensis* caught in the middle of some aggressive open-mouth behavior. During this period, they will often bite the hand that feeds them.

of fish. What is accomplished with this method is, in a way, tricking your cichlids into thinking you are one of them.

What you do is grab a handheld mirror and put it up to the glass so they can see their reflection. Cichlids kept singly or in pairs may be reluctant to come up and investigate their reflection at first. This is because they are not used to seeing more of themselves around. But soon this will change as they start coming up to the glass, trying to get what they think is one of their kind.

When this happens, you want to hold the mirror in such a way that you can easily turn it downward, showing your hand, and then quickly bring it back up so they see their reflection again. This will quickly train them to associate you with one of their own.

Another way to train your cichlids is by playing hide and seek with them. Put your finger on the glass, and run it down until they can't see it anymore. Then pop it back up. Doing this not only gives your cichlids something to do, but also trains them to associate you with activity and interaction, much like a dog running up to you with a ball wanting to play fetch.

Cichlids will also start to demand your attention just like dogs do. If you spend a lot of time with your fish, you will become their companion. When this happens, be prepared to enter a whole new world of enjoyment and fun with your fish.

A Perfect Companion

Much like dogs, cichlids have personalities and temperaments that vary just as much as the weather here in Texas. If you spend time with your cichlids and

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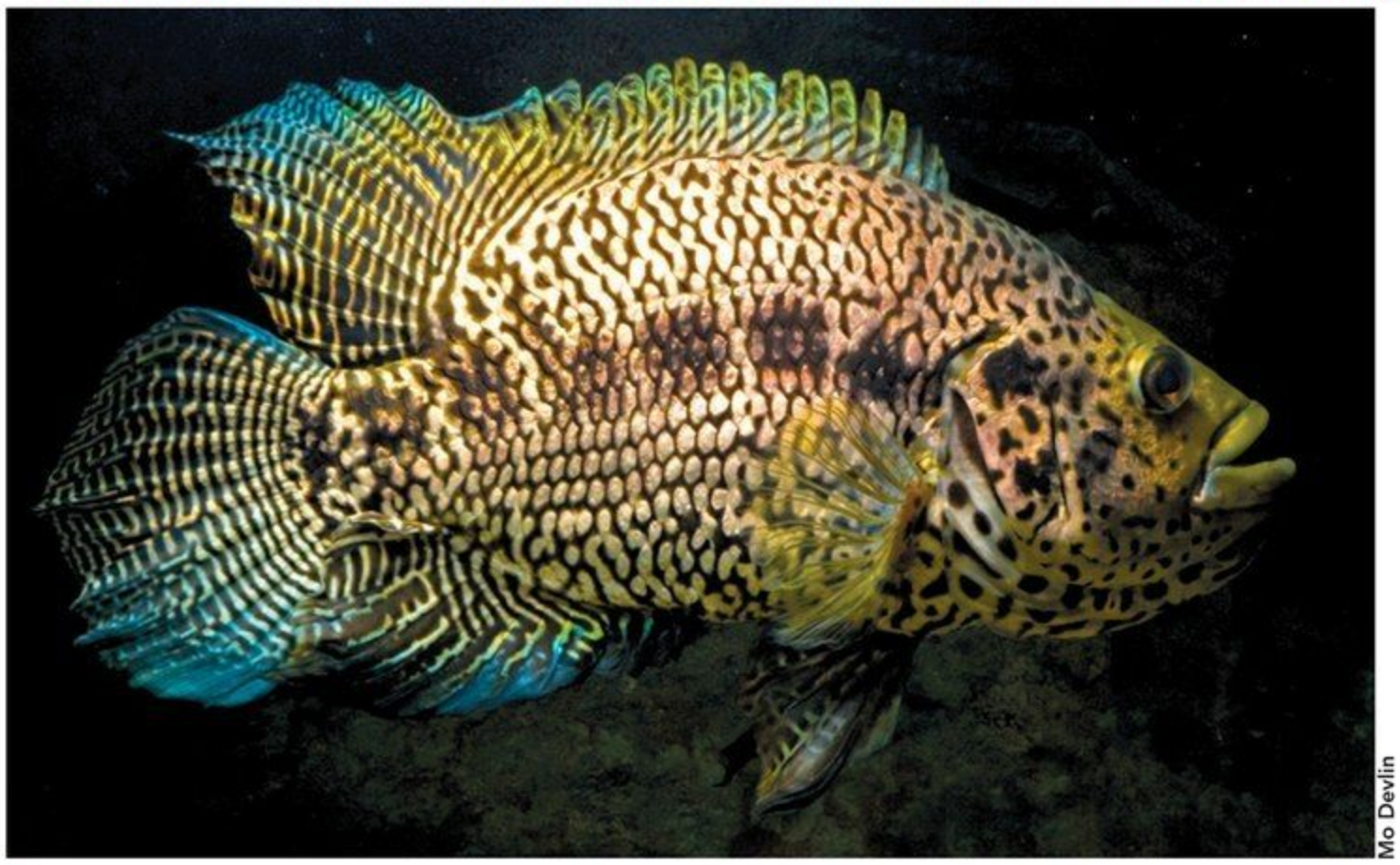
Mo Devlin

■ A *Parachromis managuensis* male like this can often achieve lengths of 14 inches in a large aquarium. Grabbing and spitting gravel from their mouth sometimes looks like an act of defiance rather than doing what cichlids often do—dig.



Mo Devlin

■ "Jumbo," a well known *Parachromis managuensis* in the cichlid hobby, shown here with all fins up and out in response to the owner stepping near his tank.

put in the work to get to know them, you will see the greatness they are capable of achieving. You can train them to fetch or let you pet them. You can even teach them to eat right from your hand.

At the same time, they are training you right back. You may not notice this, but how do you think the best time to feed your fish came about? Or how do you know when they need a little something extra like food or a water change? My *P. dovii* "Big Rig" is by far the best example of this. When I am in the room, he is watching every move I make. If I do not give him some kind of attention within a minute or two, he gets a mouthful of pebbles and spits them toward the front glass to get me over to his tank. Of course this gets my attention. I noticed that the whole time I was working with him, he was working with me right back, watching what I do, seeing when I have the food in my hand, and knowing the best time to get my attention so he will not have to work so hard by picking up a few mouthfuls rather than one.

When I do make it over his way, you can see his excitement. He swims in circles really fast, stopping at the front glass to greet me. When I change his water, he stays close to my hand so I can pet his dorsal fin, and he even sits in my hand when I cup it.

The strategies here are very rewarding to both parties. By playing with your fish and spending time with them, you are actually making their life in the aquarium much more enjoyable and gratifying. The time put in to achieve success in training your fish also makes them healthier by challenging them mentally and physically.

A Rewarding Experience

Central and South American cichlids are very personable fish and need human interaction when kept in the closed environment of aquariums. In return, they will give you many years of personable moments, making the experience of keeping these great fish so much more rewarding. If you haven't kept these types of fish but are thinking about keeping them, and having the resources, -I recommend doing so. Just make sure you do your research, make time to maintain and interact with them on a daily basis, and have fun with it!

Happy fishkeeping!

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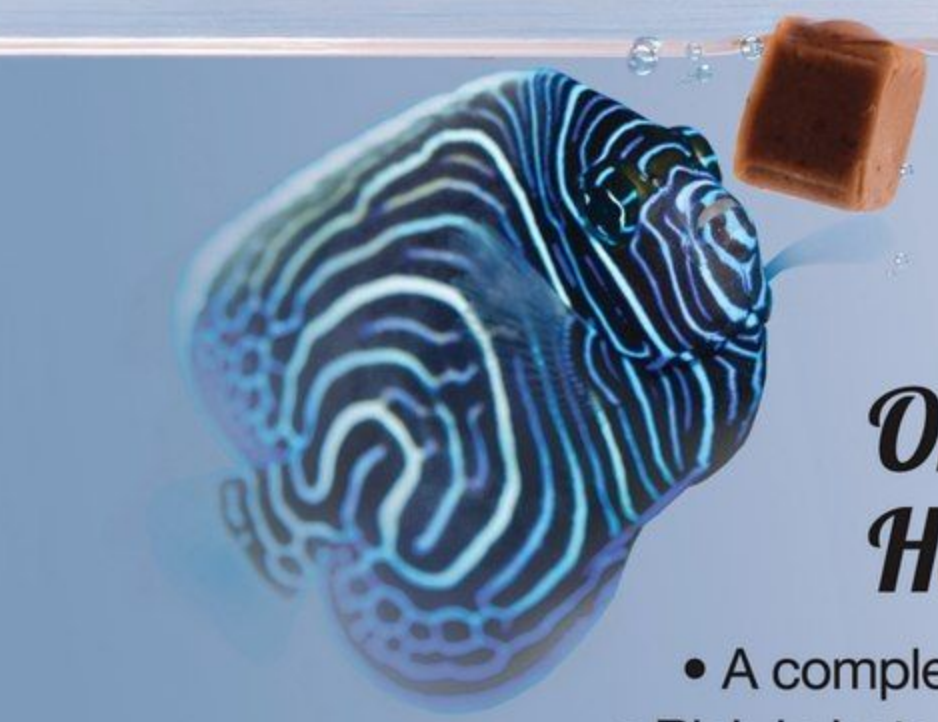

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BOOK EXCERPT: CLOWNFISHES

A GUIDE TO THEIR CAPTIVE CARE, BREEDING, AND NATURAL HISTORY

CHAPTER 2: SPECIES SELECTION

JOYCE D. WILERSON

ISBN 1-890087-04-1

SPECIES COMPLEXES

The 28 clownfish species fall into six broad groups, called complexes: the Percula Complex, the Tomato Complex, the Skunk Complex, the Clarkii Complex, the Saddleback Complex, and the Maroons.

THE PERCULA COMPLEX

Amphiprion ocellaris clowns are the icons of the marine aquarium hobby. Their pictures grace book and magazine covers, as well as advertising logos, T-shirts, and stationery. Ocellaris Clowns vary in color from dandelion yellow to tangerine and have three white bands bordered in black. Adults grow to slightly over 3 inches (80 millimeters) standard length (not including the tail fin). As is characteristic of most clownfish pairs, a male Ocellaris is smaller than a female, reaching only about three-quarters the length of its mate.

These personable fish are readily available but are often confused with *A. percula*. Although it is not a definitive test, *A. percula* clownfish usually have wider black bands bordering their white bars, particularly notable at the top rear of the head bar. If you put an Ocellaris and a Percula in tanks near each other, you may be able to tell one from the other by color pattern. It's not always a matter of simply looking at them to tell these two species apart, and it would seem that even the fish themselves have some difficulty distinguishing one another, because they will crossbreed. Both *A. ocellaris* and *A. percula* are now being tank-raised and bred selectively to amplify their distinguishing characteristics. This may make species identification easier in the future.

Amphiprion ocellaris are among the easiest clownfishes to rear; they can be kept in tanks as small as 10 gallons (38 liters) and will even spawn in them. They are inordinately mild-mannered fish, and unlike other species in this genus, you can safely keep several *A. ocellaris* in the same tank; all other clownfishes are far less tolerant of the same species sharing their nesting area. However, no more than one spawning pair will form in an aquarium. In one of my aquariums, I have four *A. ocellaris*; which I've nicknamed Mom, Pop, Nursemaid, and Goaway. Nursemaid is the heir apparent and helps tend eggs. Goaway shares the aquarium but only at a safe distance.

There is a solid demand for tank-reared Ocellaris, because the species is popular and because wild Ocellaris do not ship well. Far too often, wholesalers and retailers buy wild Ocellaris only to watch helplessly as 50 to 100% of the fish succumb to shipping stress within the first week of arrival. The cause is thought to be a susceptibility to bacterial or viral infections exacerbated by overcrowding. Avoid purchasing an Ocellaris that has been recently received and is either lethargic or swimming frantically at the water's surface. Aside from susceptibility to shipping stress, Ocellaris are hardy and acclimate quickly to aquarium conditions. Their primary defense is to acquiesce in the face of challenges. They seem to realize that they are not large enough to offer much of a fight.

Ocellaris are one of the poorest swimmers of all the clownfish species; they choose a small territory in the aquarium and seldom stray far from it. Even at feeding time, they may pass up foods dropped too far from their security zone. The male and female of a pair are usually inseparable. Males are covetous of their eggs and may go into a "rage" upon noticing that their eggs have been swiped by the human caretaker intent on hatching them in a separate tank. It takes hours or days for them to forget their loss, after which they return to their normal genial behavior.

Ocellaris larvae accept brine shrimp earlier than do most clownfish larvae; rotifers (zooplankton) are their primary food for only

about the first four days. They metamorphose from larvae to juveniles early as well, sometimes completing metamorphosis in as little as six days after hatching.

Ocellaris juveniles reach marketable size in about five months. Inquisitive by nature, juveniles of this species will often swim to the surface of their tank when approached, and even push an eye above the water, seemingly for a better view. If there is a downside to raising Ocellaris Clowns, it is only that they are too difficult to part with.

No clownfish species schools in nature, but as small juveniles in home aquariums, Ocellaris school in a tightly packed mass at night or when frightened, a defensive behavior designed to give the illusion of a single large organism and thus dissuade predators from attacking. Other explanations offered for such schooling suggest that it reduces the chances of any single fish being eaten (dilution effect) and/or that predators have a hard time targeting a single individual in a tight group (confusion effect). I've seen upwards of 200 *A. ocellaris* in a single clump smaller than my fist when I've sneaked to their tanks at night just to look at their peculiar array. The clump resembled a drifting blob of orange gelatin.

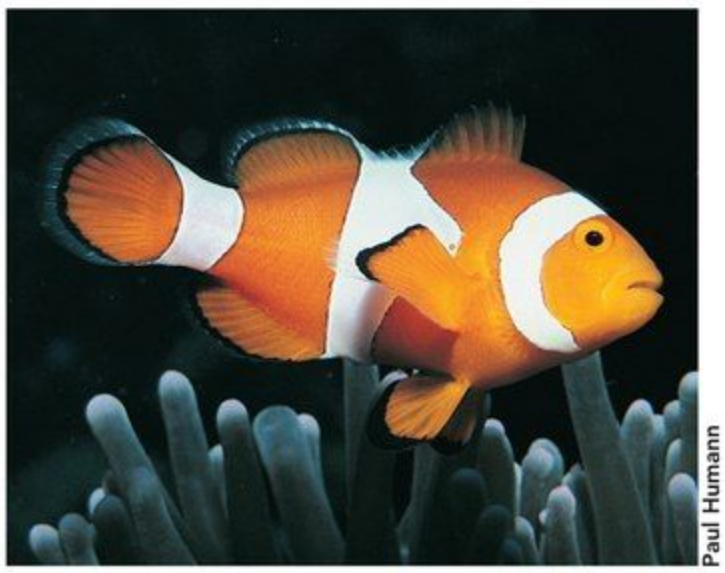
It seems fitting that *A. ocellaris*, perhaps the most popular of all marine fishes, was the species reared by Martin A. Moe, Jr. in the early 1970s, signalling the possibility of commercially culturing ornamental marine fishes.

Amphiprion percula, Percula Clownfish

Amphiprion percula clownfish are also very poor swimmers and seldom venture outside of their small territory to scout around the tank. I have one pair that, as far as I have seen, has not ventured more than 6 inches from their homesite in years. They are stuck in their comfortable rut.

Insecure Perculas may hide and remain hidden for a day or two, or even a week. Many times I've torn down rock pile homes to find a sulking Percula holed up. Increased security presumably comes with size.

Percula Clown males can be hopeless female-chasers, preferring to pursue their mates rather than tend to their eggs. For one Percula pair that I keep, I routinely take and artificially incubate their eggs within a few days of their being laid because the male is too distracted to keep the eggs aerated. If a Percula male is tending his eggs properly, leave them to his care, but if you notice a substantial number of eggs disappearing from the clutch each day, suspect that the male's allegiance to his mate is overwhelming his paternal behavior and take the eggs away early.



Paul Humann

■ Ocellaris or False Percula Clownfish (*A. ocellaris*): optimal choice for beginning breeders, it will mate and spawn readily, with easily reared larvae.

Paul Humann

■ Red and Black Clownfish (*A. melanopus*) showing aberrant red Fiji color form, which lacks the usual dark sides.

Paul Humann

■ Red and Black Clownfish (*A. melanopus*) with the typical pigmentation and head band seen in Indonesia and elsewhere.

Percula Clowns are similar in appearance, keeping, and culture to *A. ocellaris*, except that Perculas seem to need better water quality and grow slower, taking up to a year to reach marketable coloration. During that time, they grow into their stripes, but even at a year old, the white tail stripe may remain incomplete. They are the smallest of all the clowns, reaching only 2 inches (64 millimeters), and a 10-gallon (38-liter) tank is adequate for them.

Due to selective breeding of hatchery stocks, tank-reared Percula Clownfish are readily available in several color variations, including tangerine, bittersweet (or dark orange), and nearly black. A striking bright red strain and a black strain have been set in Perculas at the C-Quest Hatchery in Puerto Rico.

Physically, there is little difference between Ocellaris and Percula Clownfishes. Generally, Ocellaris Clowns have 11 dorsal spines while Perculas have just 9 or 10, but this is not always true, and believe me, it is very difficult (impossible for most of us) to count them on a live fish in an aquarium. Ocellaris Clownfish commonly have 17 pectoral rays while Perculas usually have 16, but they can range from 16 to 18 on Ocellaris Clowns and from 15 to 17 on Perculas. According to Fautin and Allen, the anterior part of the dorsal fin ray is taller on Ocellaris than on Percula, but the difference is scant.

These two species also act differently: Ocellaris Clowns usually live in the middle third (vertically) of an aquarium, while Perculas live near the surface. It can be challenging to make either one of these species settle into a territory away from the surface. I've sometimes had to suspend conch shells and rocks from glass bars placed across the top of the tank to encourage them to give up their itinerant lifestyle.

In nature, according to Fautin and Allen, Perculas occupy a smaller geographic region than do Ocellaris. Between these two, specimens caught from the wild are more likely to be Ocellaris, which is found widely in Indonesia and the Philippines, the two leading marine fish exporting countries.

While Ocellaris Clowns are usually mild-mannered, I have found that wild Perculas can be gangsters that attack tankmates and keepers. Tank-reared Perculas, however, are amiable towards their custodians, bobbing about the water's surface when greeting their owner, but they remain hard-hearted towards tankmates. Even Maroon Clownfish, known for being intolerant of other clowns, can be held at bay by a tank-reared Percula, an odd tournament to witness, since Perculas are the smallest clownfish while Maroons are one of the largest.

One interesting Percula quirk: the juveniles keep their top fins oriented towards the strongest light. You can confuse them by moving the overhead tank lights to the side,

Paul Humann

■ Tomato Clownfish (*A. frenatus*): a robust species popular with aquarists and a good candidate for captive propagators.

Gerald Allen

■ Australian Clownfish (*A. rubrocinctus*): hailing from northwest Australia, this may be the least hardy of the Tomato Complex.

Denise Nielsen Tackett

■ Red Saddleback Clownfish (*A. ephippium*): the clown without (adult) stripes is bold and hardy, but copper-intolerant.

Roger Steene

■ McCulloch's Clownfish (*A. mccullochi*): a coveted rarity from Lord Howe Island that needs a cool, subtropical aquarium.

causing them to "stand on their heads" to keep their top fins oriented toward the light source.

The Tomato Complex

The adults of the Tomato Complex are large, oval-profiled or deep-bodied, and powerfully built.

Amphiprion melanopus, Red and Black (Cinnamon) Clownfish and *A. frenatus*, Tomato Clownfish

Red and Black and Tomato Clownfish are excellent beginners' fishes, physically robust, hardy, and readily available. Both species have healthy appetites and feed well, avidly accepting aquarium foods. Female Red and Black Clowns reach 3 inches (90 millimeters), and Tomato Clowns can be over 4 inches long (110 millimeters). The females are large, so give them a roomy tank—over 40 gallons. Males of both species are much smaller, reaching only about half the length of their mates. (For every clownfish generality, it seems, there are nonconformist individuals. I have seen more than one spawning pair of Tomato Clowns where the male was as large as its mate.)

Tomato Clownfish range in color from burnt orange to tomato red. As females mature, they turn dark brown from the eye to the tail, but their faces remain bright orange or red, and all of their fins retain their bright hues as well. Male Tomato Clowns keep their youthful bright red coloring throughout life. Two strains of Tomato Clownfish are available: blue-striped and white-striped. It may take a little studying to detect the blue in the stripes of the young ones, however. Very young specimens have three stripes. Sometimes you can find them with their juvenile striping, but all clowns from the Tomato Complex grow out of their stripes—their tail and midbody band white stripes recede until only the white head band remains.

Juvenile Tomato Clowns fight each other more tenaciously than most *Amphiprion* clowns, and placing more than two in one aquarium invites harm to weaker individuals. As adults, female Tomato Clowns are vicious, more so to people than to other fishes. They are quick to bite the hobbyist intent on tank maintenance. On the other hand, they are not too picky about mates and will spawn with other members of the Tomato Complex.

Red and Black Clownfish are a burnt orange color as juveniles. Adults have just one stripe at the head, but juveniles of this species (like all Tomato Complex juveniles) have three. Mature Tomato Clowns possess red pelvic and anal fins, whereas mature Red and Blacks usually have black pelvic and anal fins. (Localized patches of Red and Black Clownfish are distinctly colored, sometimes revealing their origin. Specimens of *A. melanopus* from Polynesia, Fiji, and Tonga have red pelvic and anal fins, not black. Coral Sea adults lack head bands. These are less frequently seen in the aquarium trade.) Either blue-striped or white-striped Red and Black strains are available.

Both Tomato and Red and Black Clownfish are species I would include on an easy-to-rear list. Their larvae quickly become skilled hunters, and juveniles readily accept numerous foods. Juveniles are fleet little fishes that get excited at feeding times and avidly attack their prey. They also tolerate inferior water conditions.

A. rubrocinctus, Australian Clownfish

There are three similar, less commonly available species in the Tomato Complex. One is the Australian Clownfish, *A. rubrocinctus,* which is burnt orange with a white head band stripe that lacks a pronounced black margin in adults, in contrast to the black border around the white stripe on both Tomato and Red and Black Clowns. The fins, nose, and belly are red in the Australian Clownfish. In my experience, these are not as hardy as the more popular Tomato, Red and Black, or Red Saddleback Clowns.

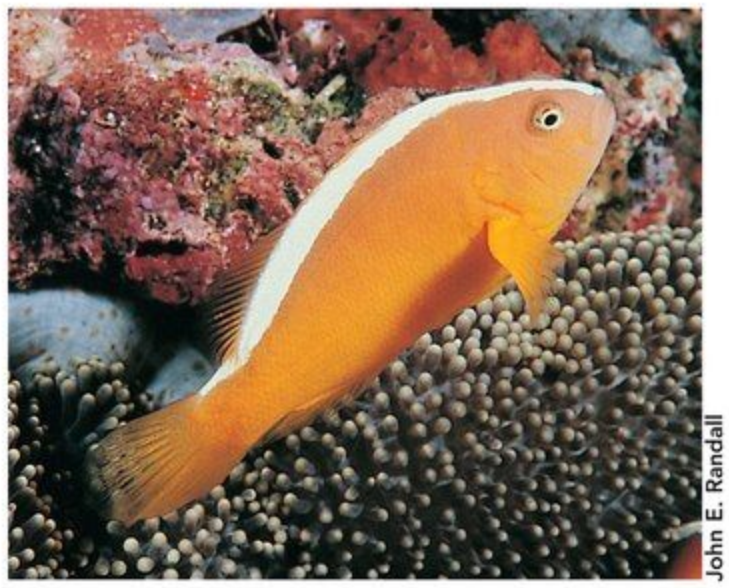
A. ephippium, Red Saddleback Clownfish

The second similar species is the Red Saddleback Clown, *A. ephippium*, which is the only clownfish that usually lacks any striping as an adult. They do, however, have a white head band stripe that persists throughout their juvenile lives. Red Saddlebacks are yellowish orange, with a mahogany-colored dot that develops on the fish's flank as it matures. Initially about the size of its eye, this dot grows and eventually covers nearly half the fish's body. The tail and rear dorsal fin may become mahogany-tinted as the fish matures.

Red Saddlebacks are bold and hardy fish, but they are unique among clowns in their nearly complete intolerance to being treated with copper. Copper medications cause high mortality as well as skin lesions. (If copper must be used, limit its application to two days

Norbert Wu/Mo Young Productions

■ Pink Skunk Clownfish (*Amphiprion perideraion*): hardy but somewhat timid, and a challenging species for breeders.



John E. Randall

■ Orange Skunk Clownfish (*A. sandaracinos*): similar to *A. akallopisos*, but with a wider dorsal stripe and an orange tail.

Larry Tackett

■ Maldives Clownfish (*A. nigripes*): a hard-to-find, hard-to-keep Skunk Complex species with black pelvic and anal fins.

Gerald Allen/Enp Images

■ White-bonnet Clownfish (*A. leucokranos*): whether a species or just a hybrid, it commands high prices and much attention.

and follow the treatment with an antibiotic.) For this reason, they are probably not a good species choice for a novice aquarist.

A. mccullochi, McCulloch's Clownfish

The last member of the Tomato Complex is McCulloch's Clownfish, *A. mccullochi*. These clownfish are dark brown or black with a white face, irregularly shaped white "sideburns," and a white tail fin. They are extremely rare, and information is scarce on their hardiness. They are indigenous to a few islands off eastern Australia (Lord Howe Island Group and Norfolk Island), which are part of the most southerly coral reef in the world. If a hobbyist happens upon one of these specimens and decides to purchase it, a relatively low tank temperature would be appropriate, befitting its subtropical origins. Interestingly, the other dark brown (almost black) and white clownfish, *A. latezonatus*, is also indigenous to the Lord Howe Island Group.

The Skunk Complex

Skunk clowns are streamlined, like Ocellaris and Percula Clowns, with a body length two to two-and-a-half times longer than their maximum body height.

The three skunk clowns are all hardy but tend to be nervous and edgy. If they are to be part of a community of fishes, add them to the aquarium early and give them a chance to claim an area before introducing other territorial fishes. Once they have settled, they become bolder and may defend their territory. If added to a tank already containing harassing fishes, they will remain apprehensive wanderers and never settle. They are vigorous—suitable for beginning aquarists but not the best choice for beginning breeders, as they are difficult and unreliable spawners. Habitually, they spawn a few small hatches, then stop spawning for months or even years. Like Ocellaris and Percula Clowns, their clutches contain only a few hundred eggs. I have not seen any of them spawn in a tank smaller than 40 gallons.

The easiest of these three to identify is the Pink Skunk, *A. perideraion*, which has a narrow white head band and a white dorsal stripe on a pale pink to peach or pinkish yellow body. Males and females of this species are similar in size. Males retain pink borders on their tails and soft dorsal fins but females have whiter fins. The tail fin on *A. akallopisos* is generally white, but on *A. sandaracinos,* it is apricot-colored, like its body. Pink Skunks are the smallest skunk clownfish, reaching only 3 inches (75 millimeters) in length. The Skunk Clown, *A. akallopisos*, reaches 3 inches

(85 millimeters); at maturity, *A. sandaracinos* may be over 4 inches long (110 millimeters).

Amphiprion akallopisos, the Skunk Clown, and *A. sandaracinos,* the Orange Skunk Clown, both have a distinguishing white dorsal stripe but no head bar. The Orange Skunk has a wide, white dorsal stripe that butts against its top lip on a gleaming apricot-colored body. The stripe begins bluntly on its mouth, as if it were wearing white lipstick, and runs boldly and broadly to its tail. On *A. akallopisos,* the stripe is narrow and ends in a point, short of the mouth, and the body color is similar to that of the Pink Skunk.

A. nigripes, Maldives (Black-footed) Clownfish

Amphiprion nigripes is a species similar to the skunk clowns. It lacks a white dorsal stripe, but has a white head band with black margins on a body colored dandelion yellow to burnt orange. Uniquely, it has black pelvic and anal fins, making it look as if its lower body had been dipped in black paint. If you want this clownfish, you may have to ask your dealer to special-order it for you. A word of caution: these are intolerant of shipping stress and are one of the least hardy clowns. They are a bit small, with adult females reaching just over 3 inches (85 millimeters) long. Males are nearly as large as females. The larvae of *A. nigripes* are sensitive to strong light.

A. leucokranos, White-bonnet Clownfish

Amphiprion leucokranos is another skunk clown kindred species. It rarely appears in the aquarium trade and is not hardy by clownfish standards. Although their "classic" design features a teardrop-shaped white dorsal splash near the head (the "bonnet") and matching white splashes of color just behind the eyes on an apricot-colored body, their color and striping can be highly variable. They range in color from tan to brown to orange to pink. Siblings may have no white dorsal stripe, a full length dorsal stripe, or anything in between. The head stripe can be wide or narrow, partial or complete, white or blue.

These are the precious "mutts" of the clownfish family and are almost certainly hybrid offspring crosses between *A. chrysopterus* and one of the skunk clowns, probably *A. sandaracinos.* Maximum length for this fish is 3 inches (90 millimeters).

If you happen to see this fish and want it, you may need to make arrangements to buy it at once, as they are seldom available. Being

Paul Humann

■ Clark's Clownfish (*A. clarkii*): the most widespread of the clownfishes and a much-cherished aquarium species that grows large and breeds readily.

rare, they should fetch a hefty sum for those who can supply the aquarium market, but remember that the offspring may not all look like their parents. Regardless, it should be fascinating to see what sort of variations you get from a pair of White-bonnets.

A. thiellei, Thielle's Clownfish

Amphiprion thiellei, Thielle's Clown, has been a provisional species since two were discovered in a New Jersey aquarium in 1981. This is almost certainly a naturally occurring hybrid or a variant of some other species. Their refined facial features remind me more of *A. perideraion* than of squarer-jawed *A. sandaracinos.* Traditionally, *A. thiellei* have a complete head stripe, whereas *A. leucokranos* have incomplete head bars. However, those who have raised *A. leucokranos* in captivity report offspring with similar color and striping to *A. thiellei.* As a rarity, Thielle's Clowns should be left in the ocean or collected only on a restricted basis for scientific study, documentation, and breeding.

The Clarkii Complex

There are many species similar to the widespread Clark's Clownfish. All of the impostors, and Clark's as well, are included in the Clarkii Complex, a group that encompasses 11 of the 27 *Amphiprion* species. At this writing, many of these are still being incorrectly labeled "Sebae" Clownfish by distributors and retailers. (The true Sebae Clownfish is exceedingly hard to obtain. *Amphiprion sebae* is not even a member of the Clarkii Complex—it belongs to the Saddleback Complex, discussed below.) In fact, any yellow-and-white-striped clownfish might be sold as a "Sebae" Clown. True Sebae Clownfish, *A. sebae,* are easy to distinguish from Clark's Clownfish: the upper portion of a Sebae Clownfish's midbody band tilts diagonally back, while a Clark's midbody band is more vertical. In addition, Sebae Clownfish have only a head and a midbody band.

Sebae Clownfish occur in the wild outside the usual collecting areas, and they are rarely available. In contrast, Clark's Clowns are the most geographically widespread of all the clownfishes, occupying a vast area of the Indo-Pacific, perhaps because they are compatible with all of the ten clownfish-hosting sea anemones found there. For this reason, and because they are now tank-reared in quantity, Clark's are far more available in the aquarium trade than Sebae Clowns, or any other yellow-and-white-striped clown, for that matter.

Amphiprion clarkii, Clark's Clownfish

Amphiprion clarkii are big, bold, striking fish, and they are hardy, even by clownfish standards. Whoever started the rumor that male clownfish are *always* smaller than females apparently did not rear Clark's Clowns, for both sexes of this species are nearly identical in size. Males and females can exceed 4 inches (100 millimeters) in length.

Being comparatively large, they need a spacious 40-to-50-gallon (150-to-200-liter) spawning tank. Clark's Clowns adapt well to their glass oceans, are the fastest growing of all the clownfishes, and seem to fake constant hunger, begging for handouts from the aquarium keeper at every opportunity.

Clark's Clowns are recommended for beginning hobbyists and breeders for several reasons. They are tough fish and can withstand some water quality abuse. Perhaps because they are strong swimmers by clownfish standards, they are more often out and about, rather than hovering in one small area, and easily gain control of their territory. They can hold their own and spawn successfully even when being harassed by the dogging damselfishes often used in aquarium startups. Clark's Clownfish spawn regularly and produce large hatches. The eggs are not hidden away but are out in the open, often even on the front glass of the aquarium. Clark's males fan their eggs vigorously during hatching. While Ocellaris eggs may take hours to hatch, Clark's usually finish hatching within 30 minutes.

The coloring of Clark's Clown adults is highly variable, ranging from yellow to brown to nearly black. Adults of this species may have either two or three white or gray bands (the tail band is missing on some). Often a

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female's tail fin changes from yellow to white as she matures, but males retain at least some yellow in their tail fins, even if it is just a yellow edge.

Clark's Clownfish larvae hatch with healthy appetites and, when properly fed, are not as prone to starving within the first 72 hours as are other clownfish larvae. In fact, Clark's larvae have the opposite problem: they try to swallow food that is too big for their mouths. They may even choke on a few of the things they are bold enough to try to swallow. Mine seem to overeat if they are provided with newly hatched brine shrimp too soon. Because they are so voracious, getting them to 1 week old is not difficult. Shepherding them through metamorphosis, however, is difficult because of their need for near-perfect water quality at this stage. Once they metamorphose, they are hardy, easy to grow, and sibling fighting is not problematic. Juveniles are a little aloof and seem afraid you might harm them, but they become bolder as you gain their confidence. Food is the correct currency for buying their trust.

Gerald Allen/Enp Images

■ Barrier Reef Clownfish (*A. akindynos*): this juvenile still sports a white saddle on the tail base, which will fade in adulthood.

The marketability of Clark's fluctuates. One month, the bright yellow Clark's will be the rage, and the next month, the brown variety will be in demand. A single pair generally produces either all bright yellow juveniles or all dark yellow-to-brown juveniles. These fast-growing clowns can be marketed at 3 to 4 months of age. With one pair of Clark's, you can easily produce enough clowns to flood a local market, because their clutches contain upward of 1,500 eggs. One or two successful hatches can keep you in the fish-peddling business for months.

A. akindynos, Barrier Reef Clownfish

Amphiprion akindynos is one of the seven Clark's Clownfish look-alikes that have two white body bands as adults, one at the head, one at midbody, and none at the tail. (Juveniles may have three bands, but eventually grow out of their tail stripe.) These are a beautiful golden sienna color with thin white bars and a white or grayish tail fin. They are available if you are patient or if you special-order them, but they are not the hardiest clowns, so you may want to ask your dealer to hold them a couple of weeks before you bring them home. Barrier Reef Clowns, once settled in, adapt well to captivity. The males are as large as the females.

A. allardi, Allard's Clownfish

Amphiprion allardi is from the East Coast of Africa and is very similar to Clark's Clownfish. Allard's Clowns may have nearly black bodies when they are adults, but they lack the black pigment in their yellow pelvic and anal fins. The midbody stripe on an Allard's Clownfish is narrower than a Clark's center stripe. Allard's and the Orange-fin Clownfish (*A. chrysopterus*) look very similar, but the shape of the head stripe may help you distinguish between them: Allard's head stripes are wide at the top and pointed at the bottom, while Orange-fins are widest not on top, but behind the eyes, and the stripe points forward at the bottom. Allard's Clowns are rare but can be obtained with some diligence. Juveniles have brown or yellow tail fins capped in white.

A. bicinctus, Two-band Clownfish

Amphiprion bicinctus clowns vary in color from dandelion yellow to sienna. Their natural distribution range includes the Red Sea, the Gulf of Aden, and the Chagos Archipelago. Their head bands are wedge-shaped, with the widest part at the top of the head, projecting forward to their eyes, creating the appearance of white scarves worn on their heads. Females are larger than males. Two-band Clowns have been difficult to obtain, but are becoming more available with increased collection in the Red Sea.

In 1976, when H.W. Fricke was first discovering that male clowns could change into females, he removed a female *A. bicinctus* from an established pair. Within 26 days, the previous male laid eggs. Despite his apparent ease in spawning them, my experience with *A. bicinctus* is that they are reluctant spawners.

A. chagosensis, Chagos Clownfish

A small, virtually unattainable species is the Chagos Clownfish, *A. chagosensis*, found only in the remote Chagos Archipelago in the middle of the Indian Ocean, with a recent report from the northern tip of the Red Sea. Its head band is thin or broken on top and it has a little black smudge on its belly just above its dark gray pelvic fins. Chagos Clownfish resemble pale *A. nigripes* (which occur north of the Chagos Archipelago) with an added thin center stripe similar to *A. bicinctus*. Could these possibly be yet another hybrid?

I have never seen a Chagos Clownfish offered for sale, and they are currently regarded as nearly impossible to acquire. If you want to special-order them, you may have to convince your dealer that they really do exist and even then he may not be able to locate a source.

A. chrysopterus, Orange-fin Clownfish

Blue bands, bright yellow dorsal fins, and boxy white tail fins are common attributes of the Orange-fin Clownfish (*A. chrysopterus*), the largest of the *Amphiprion* species, with mature females reaching 5 inches (125 millimeters) in length. In comparison, Clark's Clownfish usually have white or gray bands, a tail band, and less contrasting dorsal fins than Orange-fin Clowns. The Clark's Clowns are also hardier.

Amphiprion chrysopterus may cross with the Orange Skunk Clownfish, *A. sandaracinos,* to produce the White-bonnet Clownfish, *A. leucokranos.*

Amphiprion chrysopterus has a widespread distribution in the Western Pacific, from Taiwan to Polynesia.

A. omanensis, Oman Clownfish

The last of the Clark's impostors with two bands is the Oman Clown, *A. omanensis*. It has a sweeping, forked tail fin and black or dark chocolate pelvic fins. This species has a small distribution at the tip of the Arabian Peninsula off the coast of Oman, near the Persian Gulf. I have never seen one offered for sale, and it is so rare as to be regarded by some as unattainable. Its distinctive appearance makes it an interesting prospect for the intrepid clownfish breeder able to obtain broodstock.

A. latifasciatus, Madagascar Clownfish

Another rarity is the Madagascar Clown (*A. latifasciatus*), which has yellow fins, nose, and belly and a slightly forked tail fin. As its common name indicates, it is found around Madagascar, off the east coast of Africa and is a species most hobbyists will never see, unless in a public aquarium or the product of captive breeding.

A. chrysogaster, Mauritian Clownfish

Three Clark's Clown impostors always have three white stripes and dark, almost brown, tail fins. (Rarely do Clark's have dark tail fins at the size usually offered for sale.) One of these is the rarely collected *A. chrysogaster*, which has a white border on the soft dorsal fin and on top of the caudal fin. Juvenile Clark's can share these white streaks on the dorsal and caudal fins, but they will grow out of them at about a year old, while *A. chrysogaster* retains the white highlight as adults. A yellow belly is also typical of the Mauritian Clown, which hails from two small islands to the east of Madagascar: Mauritius and Réunion.

A. fuscocaudatus, Seychelles Clownfish

Another three-stripe Clark's look-alike is the Seychelles Clownfish, *A. fuscocaudatus*, which has wide, scarf-shaped head bands and can reach 5 inches (140 millimeters) in length. Its grayish brown body, gray dorsal and tail fins, bright yellow belly, and yellow pectoral fins are typical. The margins on the white stripes of Seychelles Clowns are more blue than black. The dark rays on its tail fin most readily identify it. True to its name, this species occurs in the Seychelles and Aldabra in the western Indian Ocean.

A. tricinctus, Three-band Clownfish

A fairly localized species from the Marshall Islands, the Three-band Clownfish, *A. tricinctus*, has a uniformly dark tail fin and narrow head stripes. Its color varies from golden yellow to black. Adult females reach 4 inches (100 millimeters) in length.

The Saddleback Complex

This small complex of relatively rare aquarium species includes the Saddleback Clownfish (*Amphiprion polymnus*), which ranges from Japan to Australia, east to the Solomon Islands, and west to Sumatra. *Amphiprion latezonatus,* the Wide-band or Lord Howe Clownfish, is found only in a limited range of the eastern Australian coast and Lord Howe Island, while *A. sebae*, the true Sebae Clown, is distributed from the Arabian Peninsula to Java but is collected only infrequently. Common names can cause confusion, as the Red Saddleback Clown (*A. ephippium*) is not grouped here, but with the Tomato Complex.

All three fishes in the Saddleback Complex are large, reaching 4 to 5 inches (100 to 120 millimeters) in length. An aquarium of 40 gallons or more is advised for keeping any of these pairs.

Gerald Allen/Enp Images

■ Allard's Clownfish (*A. allardi*): another Clarklike species, with a narrow midbody stripe and a head bar that tapers downward.

These dark fishes are perhaps the clownfish group least suited to captivity. In general, clownfishes' tanks can be kept in occupied areas of the home, but an exception must be made for the Saddleback Complex. While they are adapting to their new environment, night motions (like walking past their tank) can cause these fishes to panic and slam themselves into the sides and tops of their aquarium. Although calmer than most other clownfishes during the day and readily accepting of aquarium foods, they can still be "spooked" by a hobbyist just reaching into the tank. This produces a frenzy of destructive swimming and jumping. Do not assume that these fish have become acclimated until they have been in your tank for more than three months. After this period, there may still be episodes of panicky behavior. Even worse, they (particularly *A. latezonatus*) may die mysteriously two or three months after being confined. Use a fully covered top on their tanks and make sure the tank decor allows for a long, unobstructed raceway.

The Saddleback Complex fishes also suffer from collection and transportation stress and often arrive at retailers' shops in poor condition. The highest clownfish respiration I've ever encountered—116 "breaths" per minute—was in an *A. polymnus*. A clownfish cannot sustain that rate for long. I've had fair success countering their stress by placing them in tanks with severely depressed specific gravity (1.012 to 1.014) for the first couple of weeks.

Once adapted (no small feat) these fishes do reasonably well and have spawned in captivity, although tank-raised adults are scarce, due to their fragility. In Italy, hatchery-raised *A. sebae* are more common. Selective breeding for hardiness and calmness could benefit this group, but it will take persistence and finesse.

Amphiprion polymnus, Saddleback Clownfish

The first classified clownfish species was *A. polymnus*, the Saddleback Clownfish, originally identified by the Swedish naturalist Carolus Linnaeus in 1758. Those were the days before scuba divers, of course, hence specimens for identification were dredged from the ocean and the relationship between the clownfishes and their host anemones would wait more than a century to be observed. Until then, the Saddleback Clownfish was just considered another small, colorful member of the damselfish family.

They can reach more than 4 inches (100 millimeters) in length. Two distinct strains, quite different in appearance, are available. Conventional Saddleback Clowns have a white head bar and a saddle-shaped midbody bar (wide at the top, missing at the bottom). The face, lower body, and pectoral fins are yellow or, occasionally, burnt orange. The upper body is black, with the black tail fin circled in white.

The black variant of *A. polymnus*, sold in my area as the "Black Percula," is an attractive fish. Members are black-bodied with yellow faces, white-fringed tail fins, and bright yellow-outlined pectoral fins. They have conventional Saddleback striping on the head and tail only. The center stripe abandons the saddle shape for which the species is named.

A. latezonatus, Wide-band (Lord Howe) Clownfish and *A. sebae*, Sebae Clownfish

Wide-band Clownfish range in color from golden brown to black, with three white stripes. The middle bar is distinctively broad—wide enough at the bottom to extend from the pelvic fin to the anal fin. This species does best in a cooler aquarium (22 to 25 degrees C), and is not easily obtainable. The name "Sebae" is often misapplied to various members of the Clarkii Complex, but true Sebae Clownfish are far from commonplace in the aquarium trade. Sebae Clowns have two white bars, with the body stripe forming a rough S, tilting at the top toward the rear of the fish and into the dorsal fin. They also have yellow tail fins. Juveniles are yellow but turn dark brown as they mature.

Excerpted from the *Clownfishes: A guide to Their Captive Care, Breeding, and Natural History* ISBN 1-890087-04-1. ©T.F.H. Publications, Inc. Used with permission. Now available as an e-book exclusive for Amazon Kindle, Apple iDevices, Barnes & Noble Nook, and through other major e-book retailers.

■ Fish and corals on coral reefs in the wild can experience a range of temperatures, but typically they stay between 75° and 86°F.

Marine Aquarium Basics

Part 2: Temperature Control

Philip Hunt

The name of this magazine, *Tropical Fish Hobbyist*, provides a clue to the importance of temperature control in keeping marine aquariums. Getting (and keeping) the temperature right is one of the most basic aspects of a successful aquarium, but there is more to it than just sticking a heater-thermostat into the tank. There are many different aspects of temperature control, from heating and cooling through aspects of aquarium system design, that can make it easier to maintain stable conditions.

What Is Right?

The most fundamental question about temperature control is, of course, what is the right temperature? Even if we confine the discussion to "ordinary" marine fish-only and reef tanks (specialist systems for deep-water creatures are really beyond the scope of this article), this is not such an easy question to answer. Most marine aquariums house animals that come from coral reefs, but we keep such a wide variety of creatures that the geographic areas and water depths from which they come vary greatly, as does their temperature tolerance.

Some corals, for example, are adapted to life on reef flats where, at low tide, they may be exposed to equatorial sunshine, baking in temperatures of over 40°C (105°F), followed by a drop of close to 15°C (30°F) on the flood tide, as ocean water at 25°C (77°F) washes over them. Others might come from a depth of 20 or 30 meters (65 or 100 feet), perhaps from latitudes close to the limits for coral growth, where a stable 20°C (68°F) is the norm. There is a lot to be said in favor of biotope aquariums, keeping animals from the same habitat together and fine-tuning conditions to suit them, but relatively few of us actually keep such systems; more often, we have creatures with a variety of geographic origins in our tanks.

Fortunately for reefkeepers, many of our aquarium inhabitants are reasonably tolerant of a range of temperatures. It is possible, however, to set some limits. The upper limit is perhaps easier to define than the lower: your aquarium should stay at a temperature ideally below 30°C (86°F). This is particularly critical for corals, as above this temperature, many will bleach (expel their zooxanthellae), a phenomenon seen in the wild at similar temperatures. For fishes, the upper temperature limit is less clearly defined, but it is worth noting that as the temperature rises, the maximum level of dissolved oxygen decreases, and this will ultimately affect fishes.

Setting a lower temperature limit is a much more difficult business. Corals, again, provide some guidance. Stony corals, or at least those tropical and subtropical species that have been studied in this respect, deposit calcium into their skeletons more slowly at temperatures of less than 23°C (74°F), and the process stops completely at about 20°C (68°F). This is one of the factors that determine the geographic distribution of coral reefs.

At least some of the fish species that we keep in marine aquariums are more tolerant of lower temperatures, which means they

can have a wider geographic range (as one example, think of the lionfish spreading up the East Coast of the US). Having said that, we don't know the lower temperature limits of all, or even many, aquarium fish species, but we do know about minimum water temperatures from various coral reefs. Taking those into account (and even here there's quite a wide range), we can probably set a lower limit for the aquarium of 24°C (75°F).

This gives us a range to work in of 24° to 30°C (75° to 86°F). Exactly where within that range you set your tank temperature is largely up to you, but keepers of reef aquariums tend to favor somewhere around 26° to 28°C (79° to 82°F), as this is closer to natural temperatures in regions where many corals are collected. As with salinity, which I discussed in last month's article, the exact value is not as important as keeping conditions stable. A very important point with respect to temperature is that sudden changes, even if they remain within the acceptable range, can be very damaging. Sudden dips in temperature can stress and weaken fish, leaving them vulnerable to disease; sudden increases can cause bleaching in corals.

Many years ago, I had a reef aquarium's thermostat fail when I was on vacation, and I returned to an interesting aroma and a tank at a temperature of 43°C (110°F). What was remarkable, though, was not what had died (which, unsurprisingly, was most of the inhabitants) but what had survived: a *Trachyphyllia geoffroyi* brain coral, a colony of zoanthids, and a pair of captive-bred *Amphiprion* ocellaris clownfishes. Bizarrely, the invertebrates hadn't even bleached.

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If the temperature goes above 86°F, corals can bleach, losing the zooxanthellae that give them their color.

Tyler Fox/Shutterstock

At temperatures below 68°F, corals stop depositing calcium.

Keeping it Warm: Heaters

Most aquariums use simple devices to heat the water: submersible heater-thermostats. These have been available for half a century or more; they are inexpensive, reliable, and efficient. Recent developments have improved the precision of temperature control and durability of submersible heaters.

The only real downsides of these units are a) they need to be submerged in the aquarium and they are not the most compact and discrete of devices and b) slow-moving invertebrates, such as snails and starfish, can crawl onto them and be burned if the heater then switches on. In a tank with a sump, the heaters can be positioned either in the sump or in the overflow chamber, which solves both problems. Even without a sump, it is usually possible to conceal heater-thermostats in the tank decor, and heater guards can be used to prevent injuries to invertebrates.

Submersible heater-thermostats are not the only way of heating an aquarium. There are also flow-through heater-thermostats that are plumbed into either sump return pipes or pipes from filters, heater-thermostats built into canister filters, and heating mats that fit underneath the tank and can be controlled by internal and/or external thermostats. All of these work, but (in the case of any kind of heater in direct contact with the water) you need to be sure they are suitable for marine aquarium use.

Manufacturers of heater-thermostats and other heating equipment typically provide guidance with respect to the size of aquarium that each model can heat. In the best cases, such guidance will allow you to work out how large a heater is needed on the basis of the typical room temperature

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■ Dividing the total wattage between at least two heaters can prevent fish and coral losses if one heater fails and can help evenly distribute heat throughout the tank.

as well as the tank size; in other cases, only information related to tank size is given. In the latter case, if your aquarium is in a colder-than-average location, you'll need to use a higher-wattage heater-thermostat than tank size alone would suggest.

One good practice with any kind of heater is to split the required heating power (the total wattage) between two or more units. This is because in the (now rare) event of a thermostat failing, it is most likely to fail with the heater switched on. If you have a single unit, there is a good chance the aquarium will overheat quite quickly. If you have two smaller units, however, overheating will be slower so you have the chance to notice the problem before it gets too bad. If you have a single unit and it fails with the heater off, you will have lost all heating and the tank could cool down to dangerously low temperatures. With multiple units, one failure will still leave some reserve heating capacity.

Cool It

Preventing your aquarium from overheating is a more complicated business than keeping it from cooling down. Indeed, for many of us, this is the most common issue in temperature control, which sounds counterintuitive—after all, most people reading this will live in temperate zones and we are trying to keep aquariums at tropical temperatures. The problem arises from a combination of summer temperatures and heat generated by aquarium equipment. If outdoor temperatures exceed around 25°C (77°F), which is not uncommon even in the dismal British summers that I'm used to, indoor temperatures can easily creep above 30°C (86°F)—and aquariums will follow suit. Throw in some heat from aquarium lights, pumps, and other hardware, and temperatures can soar.

There are a number of approaches to dealing with overheating. The most obvious solution (and for many aquarium keepers in hot climates, one that will be in place already) is to cool the room that the aquarium is in using an air conditioner. This should handle both the consequences of the weather and any heat generated by the aquarium itself.

If you can't cool the whole room housing the aquarium, the next option is to cool the tank itself. For this you need a chiller. These are expensive both to buy and to run, with significant power consumption, and need to be fed with tank water by a pump. Manufacturers offer guidance as to the size of tank particular models can handle, but it's important to note that this will vary according to how much heat the aquarium system generates as well as the usual ambient temperature in the surrounding area.

For most efficient cooling, the chiller needs to be sited away from the aquarium, preferably in a cooler place. The chiller's location also needs to be well-ventilated. This is because chillers work by moving heat from one place to another. To work efficiently, the chiller needs to be able to get rid of the heat that it is extracting from the tank. This is obviously more difficult if the chiller is in a warm place. Positioning a chiller inside an enclosed aquarium cabinet is a particularly bad idea—the chiller will

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■ Large aquariums are more resistant to temperature swings than smaller ones.

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■ It is often easier to cool the room an aquarium is in than to cool the aquarium itself.

simply heat up the inside of the cabinet, making itself work harder and harder in the process, and probably heating the aquarium from underneath almost as much as it is cooling.

The ideal option might be to position the chiller in a cool basement or garage and run pipework to it, ensuring that the pump used to feed the chiller is capable of providing adequate flow even at a distance from the aquarium. As you can see, using a chiller at all is an expensive business, and to make the best of it, you need to go to some trouble. That said, modern chillers provide highly effective temperature control, and if you have a large system housing a lot of corals, lit with powerful metal halide lamps, a chiller can be a very good investment.

A less expensive way to cool an aquarium is to make use of fans. Simply blowing air across the water's surface, particularly if the aquarium has strong water movement, will cool the tank by increasing the rate of evaporation. For this to work well, the aquarium needs to have an uncovered top, which might not be ideal if you have fishes that are prone to jumping, and the increased water loss needs to be dealt with. Fans can be controlled automatically by connecting them to thermostats that will switch them on when the temperature rises above a certain level (the reverse of the usual aquarium thermostat).

Prevention Is Better Than Cure

Temperature issues of both kinds, too high and too low, can be prevented to some degree by considering them at the design stage. For example, a major source of heat in many reef aquariums is the lighting. Metal halide lights, in particular, run very hot and, as well as warming up the surrounding area, can transmit quite a lot of heat directly to the aquarium water. As most metal halide lights are pendant fittings, using a fan to blow air over them can help keep things cool but may not be enough. Fluorescent tubes, although they are often regarded as cool-running light sources, can also get quite hot, especially if several are enclosed within a canopy. In this situation, they can cause significant heating of the aquarium. Fitting small fans into canopies can reduce the problem. LED lighting is by far the best option in this respect, as heat transfer to the aquarium is minimal.

Water pumps can also have a significant heating effect. This is most marked with submersible pumps, whether used for water movement or as sump return pumps. Air-cooled return pumps mounted outside sumps are better from the perspective of temperature control, as are circulation pumps that have the motor outside the tank and only the impeller inside. In smaller tanks, using air pumps to provide water movement is effective and prevents heat transfer to the water.

Finally, it's worth noting that tank size has a major impact on susceptibility to temperature changes. Large aquariums heat up and cool down much more slowly than small ones due to their greater water volume. In practice, this means that nano aquariums are very vulnerable to dramatic shifts in temperature, in both directions, and this should be considered when deciding where to position them. It's usually best to keep aquariums in rooms that have stable ambient temperatures, but this is particularly important for small tanks.

Thermometers

However you heat or cool your aquarium, you need to use a thermometer to measure the actual temperature—settings, and even readouts, on heater-thermostats and chillers may not be particularly accurate. There are several different types of thermometers on the market. Stick-on external strip thermometers are inexpensive and fine for non-critical applications, but they're not

the best when trying to keep temperatures within a narrow range, as they tend not to be very precise or easy to read. They are probably not the first choice for marine, and especially not reef, aquariums.

The remaining choices split into two types: alcohol (or spirit) thermometers and electronic models. Both can give accurate temperature readings, and both have their advantages and disadvantages. Alcohol thermometers need no batteries and are usually inexpensive and fairly easy to read. They can be found in a wide range of sizes. They are made of glass, and most are designed to float upright by having small metal beads in their bases. Alcohol thermometers commonly come with suction cups so they can be affixed to the front or side of the aquarium.

Phil Hunt

If the suction cup on a thermometer fails, causing the thermometer to get buffeted around and broken, metal beads and alcohol can be released into the water.

The main downside to alcohol thermometers is that they can be quite fragile. The glass needs to be thin for efficient heat transfer to the alcohol, and if the sucker holding the thermometer to the aquarium wall fails—as most eventually do, especially in marine tanks—the thermometer can float free in the tank. In an aquarium with strong water flow, the thermometer can then be washed around the tank, possibly crashing into rocks and breaking, which could lead to metal beads and alcohol being released into the water. This problem can be solved by using a thermometer that is designed to hook over the rim of the aquarium. These work only on aquariums without braces and need to be the right size to fit a given thickness of glass. They also tend to be expensive, but they are an elegant solution.

There are two main types of electronic thermometers: internal and external. Both have digital LCD displays. Internal electronic thermometers are fitted inside the tank, fixed to the glass with a suction cup. These are neat and need no wires, but there is always a risk of the suction cup failing. Also, these thermometers have internal batteries, which could be toxic if the casing leaks. External electronic thermometers can't be submerged and are usually either fixed to the outside of the aquarium or placed on the canopy, with a probe placed in the water. Some models have features such as the ability to record maximum and minimum temperatures or to switch between measuring the temperature of the water and the surrounding air. The only real downsides of these thermometers are that they can be more expensive than spirit thermometers and the wires and probes can be visually obtrusive, although it is usually possible to conceal them.

TRISTAN LOUGHER

BUYERS BEWARE: THE COPPERBAND BUTTERFLYFISH (*CHELMON ROSTRATUS*)

■ Copperband butterflyfish (*Chelmon rostratus*).

Selecting marine fish for a new aquarium is a process that should begin long before entering your local aquarium store. Although advice from people who work with various fish species on a daily basis is often invaluable in helping compile a fish wish list, the selection process should begin with research and study to determine animals that will be compatible with each other and not outgrow your aquarium. Depending upon the system, you might want to know what threat a particular species might present to corals or other sessile invertebrates or whether one species you were planning to keep is likely to leap from uncovered aquaria.

Often aquarists build their stocking list for fish around one particular species, the "must have" fish for which the aquarist sees no substitute. For many hobbyists, that species is the beautiful-yet-enigmatic copperband butterflyfish (*Chelmon rostratus*)—one of the most instantly recognizable, desirable, affordable, available, and wonderful fish that one could have the pleasure to own. Unfortunately, many aquarists stock individuals of this species without giving enough thought to their aquarium demands and many will not survive beyond a month or so. That said, the key to success lies not only in providing for a purchased specimen, but also in selecting the right individual initially.

Aquariumphoto.dk

As with many other fish that have elongated snouts and small mouths, the copperband butterflyfish removes small invertebrates from crevices in the rockwork.

Iliuta Goean/Shutterstock

Painfully thin copperbands show signs of pinching in the belly area. Frequently, the swim bladder and internal organs appear as a prominent bulge in the mid section of the fish. The damaged tail fin is far less of a problem to this individual than the significant weight loss.

Biology and Distribution

This widespread species of butterflyfish has a distribution that includes many of the major collection sites for fish intended for the marine aquarium hobby, including Indonesia, the Philippines, and Australia. A widespread and flexible species in its natural range, it is encountered in a variety of habitats, including the relatively murky waters found in river estuaries as well as more familiar reef environments. In common with other fish species with elongated snouts and small, rather delicate-appearing mouths, it specializes in the removal of small invertebrates from cracks, holes, and crevices. In an aquarium environment, this includes tubeworms and, in some individuals, nuisance *Aiptasia* spp. anemones. That is the reason many aquarists stock this species.

The Problems

Although the various problems I will mention may not apply to every specimen of *C. rostratus* that arrives in the hobby, there are general issues that affect many individuals. Understanding some of these can help aquarists avoid poor specimens with little chance of survival or increase their chances of success with this species.

Fish collected from places far from their ultimate destination in the US or Europe must be able to endure the rigors of collection, transportation, and repeated acclimation. This process consists of withholding food to prevent the transport water being fouled, unpacking and acclimation at the wholesaler's, transfer to retail shops, then purchase by customers, who stock them in their aquariums, possibly by way of quarantine systems. Many fish will recover from this ordeal in a relatively short time with no special intervention from the aquarist. However, for some species, the copperband included, action may be required.

The laterally compressed copperbands do not carry much in the way of excess muscle or fat, and the time from collection to arrival in a dealer's or hobbyist's aquarium can be rather significant. Thus the condition of many individuals is poor. If stocked into a reef aquarium where the emphasis might be on

Ian Scott/Shutterstock

■ Healthy, vibrant fish show good musculature in the dorsal region, an almost rounded appearance to the body directly below the dorsal fin.

nutrient control and minimal feeding of fish, then further weight loss is likely to occur. Then factor in the occasional "welcoming committee" in the form of territorial tangs or other fishes that will harass the copperband, and we can begin to see why many individuals do not last long in the home aquarium.

Indeed, this is one of the best-case scenarios; the Internet is littered with examples of aquarists acquiring specimens that refuse to feed altogether. There seems to be a general consensus that copperbands are problematic to feed and it just goes with the territory. However, it would seem to be common sense that if you have the choice between a feeding or non-feeding specimen, you would opt for the former. So why not ensure that it is feeding before you buy?

Looking for Clues

Imports of the copperband from Australian suppliers are occasionally available and might be sold as "giant" or "Australian" copperbands—not to be confused with the Australian endemic *Chelmon muelleri*—another fish going by the name of Australian copperband. Although for various reasons, including increased overheads, fish from Australia may command a premium, copperbands from Australian sources tend to do rather better than those collected from other regions. Looking into the reasons these specimens tend to thrive better than their counterparts from other regions might give us ideas how success with *all* copperbands, regardless of their provenance, might be achieved.

Size

"Giant" Australian copperbands are no larger when fully grown than those collected from Indonesia or the Philippines, but the specimens sold are closer to the maximum size for the species, which is around 8 inches in length. The principle behind this is, larger fish lose weight more slowly than smaller individuals and are, therefore, more resistant to starvation. Consider that there is a general rule of thumb for marine fish that the largest and smallest individuals of a species are best avoided and intermediate specimens make the best additions to marine aquaria. The copperband appears to flout this to an extent in that Australian specimens are nearly fully grown, but a great deal of success can be had with intermediate-sized individuals from other parts of the Indo-Pacific if they're given proper care and attention. However the smallest individuals, measuring only an inch or two, are certainly best avoided.

Pre-Shipping Rest

The aforementioned potential journey of a copperband is arduous, especially if the fish is dealing with the stresses of collection and shipping whilst simultaneously enduring a period of starvation. Although purging fish prior to shipping is a very necessary practice, they can still be rested between collection and purging and foodstuffs can be offered in this intermediate period. This provides valuable time for the fish to recuperate and get stronger so they're better able to deal with the transport process and, therefore, recover more rapidly once acclimated at their shipping destination.

The balance between the need for purging and allowing fish time to recover from collection and, ideally, feed is a delicate one, but the best exporters will manage this. However, not all aquarists can source or afford Australian copperbands. In addition, the larger size of specimens means that they should be stocked in aquaria of 130 gallons or more, whereas smaller individuals from other sources can be added to systems of half this size.

So, what should aquarists look for when selecting specimens from Indonesia or the Philippines? It should be noted that copperbands from these sources are usually able to recover their pre-collection body weight if provided suitable rations. Issues occur primarily with non-feeding specimens or with individuals given insufficient food. In my experience, although non-feeding specimens will be present among them, it is their treatment after importation and acclimation that determines the success rate with copperbands. Fortunately, there are ways to avoid problems with copperbands regardless of their provenance. There are also practices that will help prevent any issues when they are actually in residence in the home aquarium.

Steps to Success

Research and Planning

Most problems with copperbands can be avoided prior to purchase. First, determine whether the fish you already have in residence will be compatible and consider potential future livestock purchases. Planning your livestock, mapping out the order in which they should be stocked, and adhering to the stocking regime can help avoid conflict. This is a good idea for any species but particularly the copperband, which should be added before aggressive fish such as tangs and angelfish. Consider any dietary necessities for the copperband, such as the regular addition of mysids or similarly rich foodstuffs, and determine whether any future additions might compete significantly for this.

Tristan Loughe

■ Many specimens from the Indo-Pacific will arrive like this specimen. Some weight loss has occurred since collection, but otherwise it is in reasonable condition.

Observation of Potential Specimens

If there is one process that can mean the difference between success and failure with the copperband, it is observation of specimens in dealers' aquaria before purchase. It can help to have a look at a number of individuals over a number of weeks before committing to buy. First, check the body shape. Is it looking thin? Look at it head on, and pay particular attention to the area just above the eyes. Does it seem pinched or thinner than the head itself? Then check the flanks. Copperbands that have lost significant weight show a definite bulge in each flank—the location of certain internal organs and the swim-bladder—whereas specimens with good, acceptable body weight have smoother sides to the body.

Those fish that appear to be in good condition should then be offered food. Settled specimens should feed readily and with enthusiasm. The best copperbands will be swimming at the front of the aquarium facing out and expecting food.

Copperbands, like many butterflyfish, can experience an outbreak of the viral infection lymphocystis, manifested in cauliflower-like growths on the edges of the fins and occasionally the body. While these are not anything to worry about in terms of being contagious, they should be left alone until they clear up, usually a week or so later. Checking the fins of any marine fish for signs of pathogens should be a matter of course for all aquarists, although it is still worthy of mention that those of the copperband should be clear with no exposed fin rays in the dorsal fin.

After Stocking

Even in the best-planned, most thoroughly researched additions of the copperband, things can go wrong. When water quality or other conditions are less than acceptable (and not necessarily through measurable parameters, such as pH or ammonia levels), it's not uncommon for an apparently vigorous specimen to stop feeding entirely. I am aware of several instances in which a specimen that had been feeding in a dealer's aquarium refused food when placed in an aquarist's system but then resumed feeding a couple hours after being returned to the dealer.

Although exact reasons for such phenomena may be difficult to ascertain, an awareness of this potential situation may help the frustrated aquarist make a decision regarding the future of the fish. Dealers will not appreciate the return of an emaciated specimen if all attempts to encourage it to feed have proved futile. Give it a couple days to settle, and observe it during feeding times. Might there be a reason it isn't feeding, such as harassment from other fish? Is it picking at an abundance of naturally occurring food in the aquarium? Sometimes adding a morsel of food that will hang around for a little while, allowing the copperband

Aquariumphoto.dk

■ A copperband butterflyfish should be added to the tank before any aggressive feeders, such as tangs and angelfish.

time to discover it away from the frenetic activity of feeding time, is useful. Bivalve mollusks—clams, cockles, or mussels—are very useful in this role.

If an individual fish refuses to feed after a few days, then it is best to return it to the dealer. This assumes that you verified it was feeding before purchase. Chances are, returning it will give it a better chance of survival, as there is a strong possibility it will feed again when stocked in the original or a similar aquarium.

But what should you do if you end up with a non-feeding specimen but have no information on whether it was feeding or not?

Tempting a Non-Feeder

Many aquarists will employ a quarantine aquarium before stocking any species of fish into their final home. Such a system is particularly useful for non-feeding copperbands, especially when stocked with plenty of live rock and an ultraviolet sterilizer installed to assist in the reduction of pathogens. Although the live rock precludes the use of copper-based parasite treatments, it does give individuals natural live foods to nibble at. Getting the fish to feed on anything is a good starting point, and from there the aquarist can try other offerings. These can be live items, such as mysids, brine shrimp, and/or clams. Even living freshwater insect larvae, such as bloodworms or glassworms, may be readily accepted. Once a vigorous feeding response has been achieved using live offerings, then the aquarist can attempt a gradual weaning of the fish onto frozen offerings.

Tristan Lougher

■ Even though this individual was feeding with enthusiasm, it needs the addition of extra rations several times per day to reverse its weight loss. Note the slight bulge in the midsection of the body and the lack of muscle below the dorsal fin.

"Overfeeding" Newly Introduced Specimens

As previously mentioned, there is a tendency, particularly among reefkeepers, towards feeding fish just enough to keep them in good condition so that dissolved nutrients, such as nitrate and phosphate, stay within acceptable levels. This can work well even for aquaria containing a copperband butterflyfish. However, if an already-skinny specimen is introduced, even if it's feeding heartily, the provision of meager rations is unlikely to reverse the weight loss.

Consider also the relatively strong water currents in reef aquaria in comparison to most dealers' aquaria. Those strong currents mean the fish must burn more energy to hold its position in the aquarium. Even healthy specimens with good body weight are likely to lose condition over time.

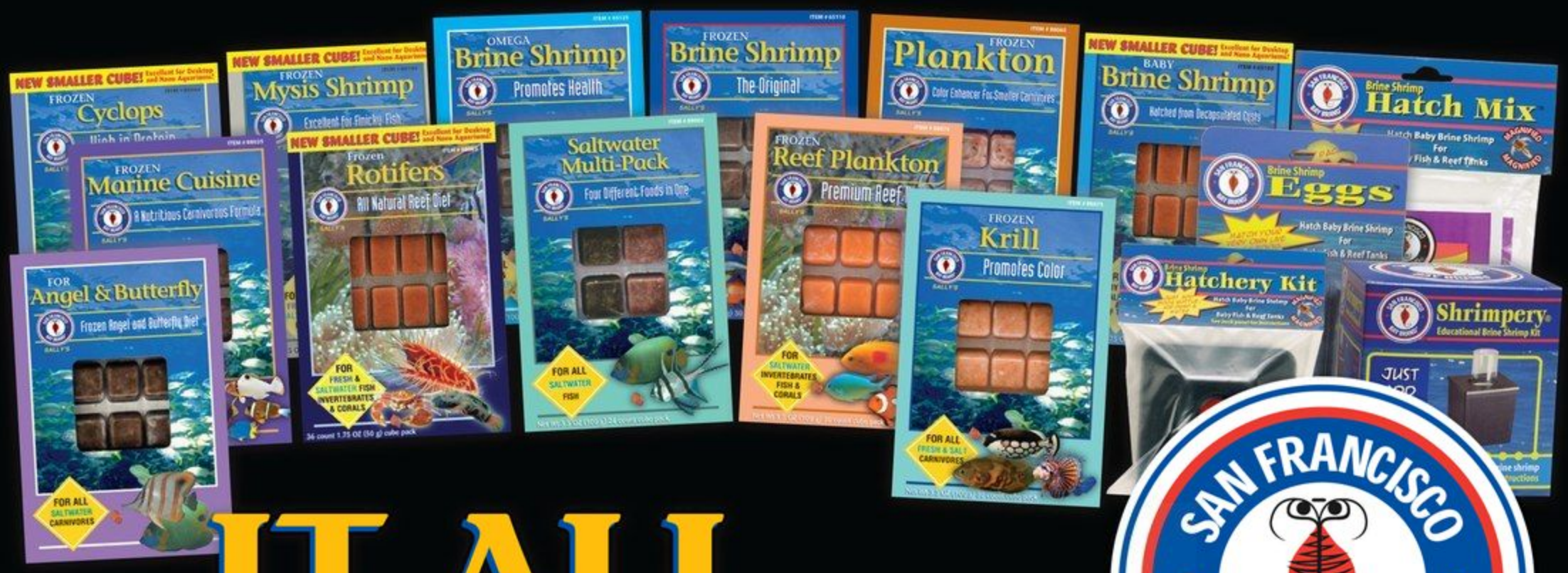
Although skinny individuals should ideally be ignored as potential purchases, if one arrives in your aquarium, it may require small feedings several times per day if it is to thrive. Little and often is the key. Also, be sure to actually watch the fish feed, as in a busy aquarium, it may be outcompeted by its tankmates. Fine tune the ration as required, perhaps reducing it slightly as the fish recovers its condition.

Quarantine, or isolation, aquaria can be very useful in reversing the weight loss experienced by copperbands when they are recovering from the shipping process. Having a system in which several small feedings can be made in a day without worrying about the nutrient impact on other aquarium animals is extremely helpful. It is not impossible to do this where other fish and invertebrates are present, but it will usually necessitate the addition of significantly larger quantities of food.

Unfortunately, there will always be individuals that, for one reason or another, will not feed. These reasons, if known, might be beyond the scope of the aquarist to fulfill, or they may remain a mystery. Butterflyfish in general appreciate highly oxygenated, clean water (with a relatively high redox value), but there are instances in which a copperband given apparently perfect conditions will not appreciate them. It's best to return such specimens sooner rather than later.

Prep Before Purchase

The copperband butterflyfish is unlikely to lose popularity with aquarists anytime soon. Provided it remains as inexpensive and available as it is currently, it will always attract hobbyists willing to give it a home. I hope this article will help reduce the incidence of spontaneous, compulsive buys. A little time spent researching, planning, and observing a potential addition can save time, money, and not a little guilt and regret. Selectivity on the part of aquarists can lead to increased standards further up the supply chain, and that can only be a good thing. The fact remains that a well-settled copperband is a truly magnificent fish that can provide many years of enjoyment for aquarists. Eventually one day, all specimens might have the reputation for hardiness that is currently held by those Australian individuals.



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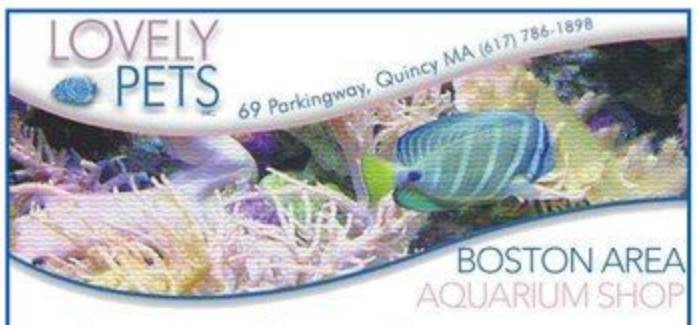

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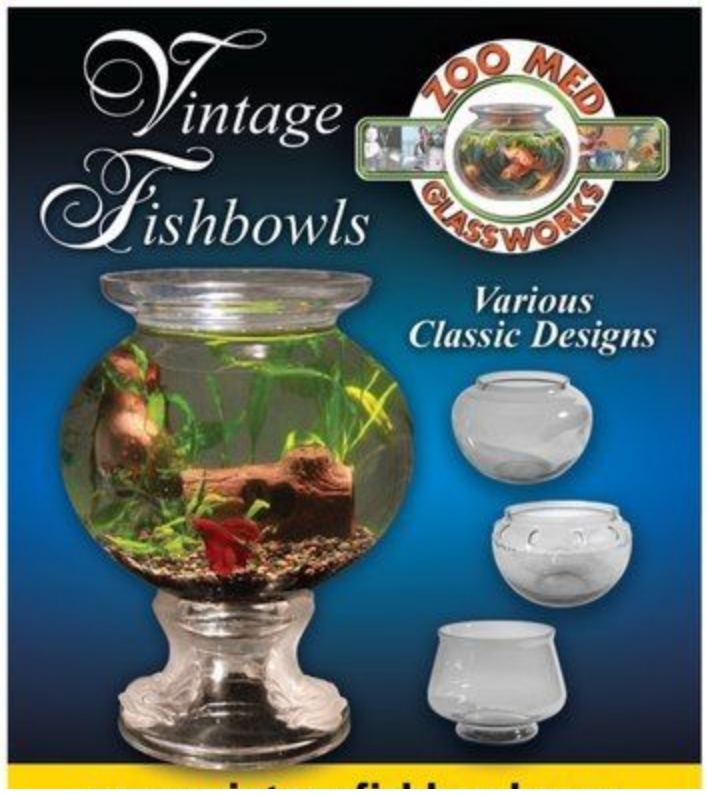

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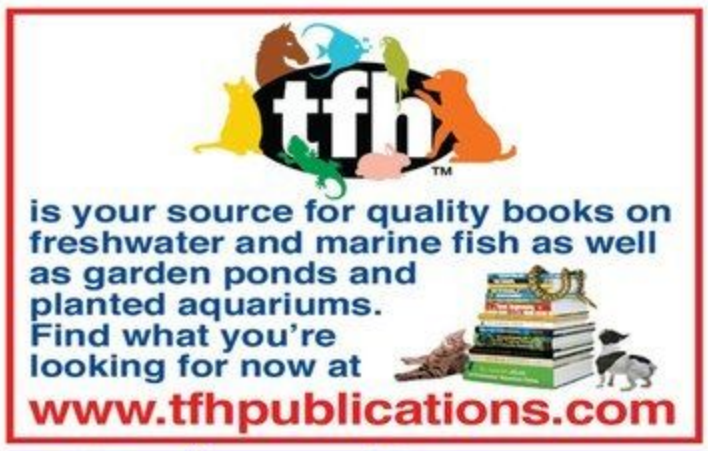

ONLINE RETAIL

aquarium society news

Béla Nagy

AKA 2013 Convention

One of the greatest pleasures for any tropical fish enthusiast is discussing and sharing experiences and successes with others who have similar interests. I had the good fortune to attend the 52nd annual convention of the American Killifish Association (AKA) over the 2013 Memorial Day weekend. The aim of this association is to advance the enjoyment, propagation, study, and conservation of killifish, as well as promote fellowship among its members. This time, the convention took place in Portland, Oregon, and was hosted by the Northwest Killie Club and the other West Coast affiliates of the AKA. The co-chairs, Barry Cooper and Brian Watters, did a wonderful job of organizing the event and making it a memorable experience.

One of the major attractions of the annual killifish convention is the opportunity to present fish in the exhibition and possibly acquire them through the auction and fish sale. The participants and members of the association entered more than 230 pairs of killifish, which were organized by genera and species groups in 15 show classes. In addition, there was an outstanding selection of fish in the "New & Rare" category. The wide range of fish included wild killies, collected during an expedition to Venezuela that had been organized specifically for the purpose of acquiring desirable species for the convention, as well as wild *Nothobranchius* species collected in DRC, a rarely visited part of Africa. Native North American killies were also present.

Marc Bogaerts, one of the speakers from Europe, made a significant contribution of more than 140 pairs of West African killifish, including 40 wild-caught pairs collected in Gabon. This extraordinary selection of fish was auctioned at the end of the meeting, and attendees who wanted to have something really unusual had the opportunity to bid on them. About 1,000 items, primarily killifish and killifish eggs, were available in the auction.

Béla Nagy

■ Frans Vermeulen begins his lecture about the Moroa expedition, one of his many collecting trips to South America.

The participants enjoyed a wide variety of talks, covering a comprehensive range of killifish genera from various continents, as well as a diversity of topics, such as the maintenance and breeding of killies, collecting killifishes in the wild, and accounts on their distribution and biogeography.

The annual fundraising effort on behalf of the George Maier Fund (GMF) offered interesting and unique auction items as well as a significant raffle. Brian Perkins (WildPERU) once again made a substantial donation, consisting of a place on one of his regularly scheduled collecting trips in southern Peru, with an estimated value in excess of $1,500. The income from this raffle went to the GMF, a tax-exempt organization whose purpose is to provide grants for research and associated activities concerning killifish. The hobbyist can, thereby, participate in extending the knowledge of killifish and, through that process, ensure their survival.

Social interaction and programs are important components of the convention. Fish-related activities, such as tours of the superb fish stores in Portland and a killifish research laboratory at Portland State University, were organized for the attendees.

It was a great pleasure for me to be a part of this highly interesting event. I am sure those who participated enjoyed the AKA convention very much and are already planning to attend next year's meeting.

Product Spotlight

pH Meters

Milwaukee Instruments has recently introduced the MC Series, a new line of Smart Monitoring Systems. The MC122 pH Controller, designed specifically for aquariums, continuously monitors and controls pH values in freshwater and saltwater tanks. User can dial in desired pH value, from 5.5 to 9.5, and set unit to activate the dosing solenoid above or below the set point, depending on application. The LED provides a visual alert when the solenoid is activated. The MC122 is easy to set up and use, with 2-point manual calibration. Digital meter features a large, bright LCD screen, 0.1 resolution with accuracy of ±.2 pH at 25° Celsius. Solenoid accepts dosing devices with 3-prong plugs. Supplied with MA911B/2 double junction electrode, 2m cable and BNC connector, 12VDC adapter, calibration solutions (4.01 and 7.01), mounting kit, and probe holder.

www.milwaukeeinstruments.com

Rotating Filter Attachment

Zoo Med Labs, Inc. announces the debut of their new Aquasweep™ Rotating Filter Attachment. The Aquasweep™ Rotating Filter Attachment can be connected to a canister filter outlet to provide strong, sweeping wave action in an aquarium. The Aquasweep™ can be used in freshwater or saltwater and automatically sweeps from side to side creating wavelike water flow to benefit corals, plants, fish, and other aquatic life. Install the Aquasweep™ at the surface to create greater surface agitation or wave action or deeper in the tank to increase flow over plants and corals.

www.zoomed.com.

Programmable LED Fixture

Aquatic Life, LLC has introduced a new line of XS High PAR LED Marine fixtures that operate through the use of built-in controllers. Users can download the feature-rich software package known as T-Time from the Aquatic Life website and then connect their computer to the XS High PAR LED fixture via a USB connection. There are 18 programmable color combinations, customized light cycles, and special features such as random cloud cover, lightning storms, and moonlight programs simulate an environment that fish and coral are exposed to in nature. The XS High PAR LED Marine fixtures are designed to replace metal halide fixtures and will be available in 14-, 34-, and 46-inch sizes. **www.aquaticlife.com**

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

in next month's issue...

desert goby

Easy to keep and breed, desert gobies are among the true freshwater gobies that can thrive in shallow tanks. Check out the October 2013 issue to learn about these and other freshwater and brackish gobies, including species profiles, care requirements, and breeding tips.

Wolfgang Somner

Pinosub/Shutterstoc

water movement

A critical component of a successful reef aquarium is proper water movement. Water currents bring food to corals, carry off their waste products, keep them clean of detritus, and promote proper growth. An expert reefkeeper explains how to achieve the perfect amount of water movement to keep your animals happy and healthy.

striped panchax

A striking killie, the striped panchax is widely available and comes in a gorgeous gold form. It makes a great introductory killifish due to its hardy nature and prolific breeding habits. The striped panchax also has a long lifespan and will be a showpiece in your setup for years to come.

Mark Smith

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

Content subject to change.

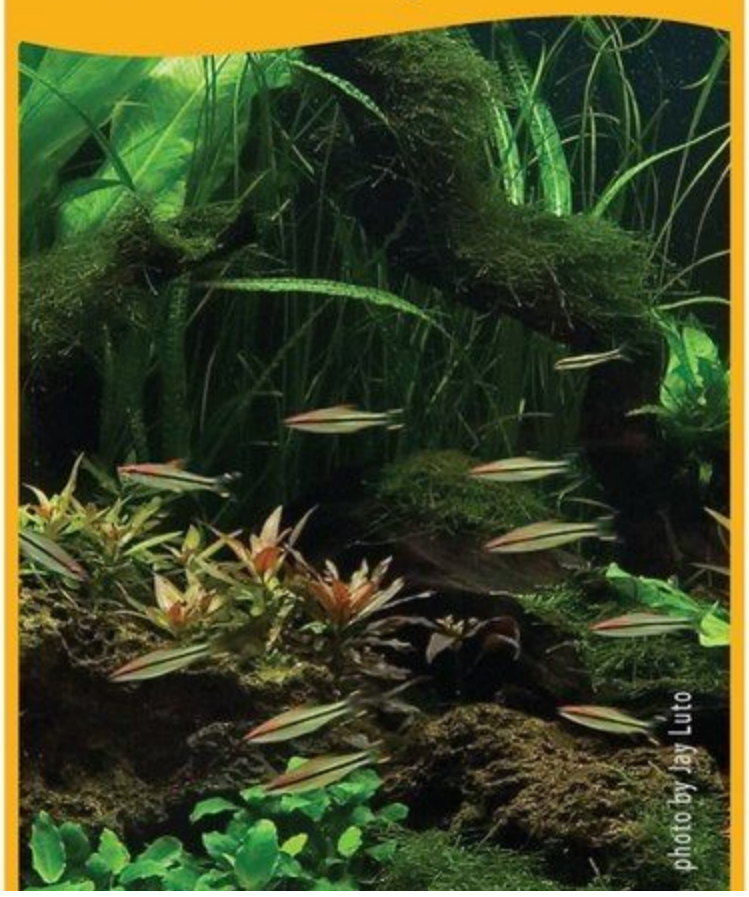

photo by Jay Luto

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Photo: Leighton Lum

yellow tang

(*Zebrasoma flavescens*)

One of the most popular fish in the marine hobby, the yellow tang is a standout in any aquarium. It can also be a helpful addition, as this herbivore will consume algae in the tank.

To keep a yellow tang successfully, you need an aquarium of at least 75 gallons to accommodate its relatively large adult size of 8 inches. *Zebrasoma flavescens* is generally a peaceful species, but it may behave aggressively toward other tangs (including conspecifics) and similar-looking species.

It is possible to keep *Z. flavescens* in groups of five or more in very large systems with plenty of hiding spaces, but intraspecific aggression is very likely to be a problem when groups are attempted in average-sized home aquariums.

If you feed plenty of algae-based foods, have a crop of algae for it to graze on throughout the day, and maintain high water quality, you should be able to enjoy your yellow tang for years to come.

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