REEF HOBBYIST MAGAZINE

FOURTH QUARTER 2013 I VOLUME 7

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FEATURES

38 ON THE COVER

ADDING NON-PHOTOSYNTHETIC CORALS TO YOUR REEF – AN INTRODUCTION & HUSBANDRY GUIDE

Ngai On Young is a self-professed NPS freak. From acquisition through captive reproduction, this article covers critical topics for anyone interested in keeping these gorgeous corals.

Cover image by author.

FOURTH QUARTER 2013 | Volume 7

ANNOUNCEMENTS

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Red Sea

THE GOOD, THE BAD, AND THE WILD

RET TALBOT

For the past several years, I have had the opportunity to explore the source country side of the marine aquarium trade. One of the goals of those explorations has been to provide a window through which aquarists can view a side of the trade that is typically at best out-of-sight-out-of-mind and at worst intentionally less than transparent given the unsustainable and illegal practices that continue to plague the collection side of the industry.

BACKGROUND AND PERSPECTIVE

While I'm professionally interested in the big picture at the confluence of fisheries, science, socio-economic development, and conservation, it has always been my personal hope as an aquarist that a better understanding of where the majority of marine aquarium animals originate would lead to some aquarists using their purchasing power to support a sustainable, equitable, and legal trade. To me, it is not at all unlike what commonly happens now with coffee, lumber products, and seafood. These are industries that, while not without their issues, have all found a market share interested in seeing sustainability and fair trade front and center. While some aquarists have responded to the often unpleasant realities of marine aquarium fisheries in source countries like Indonesia and Philippines by advocating a trade dependent almost wholly on captive-bred animals (much like the freshwater trade is), some of my most profound experiences throughout the smaller developing island nations of the Indo-Pacific have led me to believe that reducing the trade's connection to the people and reefs of the region would be a very great loss from both an environmental and socio-economic perspective.

While the stated goal of a marine aquarium trade based solely on captive-bred animals is often to alleviate pressure on embattled reef ecosystems, I fear the wholesale elimination of marine aquarium fisheries in the name of sustainability, conservation, or any other green moniker could actually have the opposite effect. My experience has led me to believe sustainable marine aquarium fisheries can be one of the best resource extraction industries when it comes to appropriate socio-economic development and creating real economic incentive to conserve reefs. Eliminating these fisheries can create a vacuum that, because of an increasingly globalized world with fewer and fewer blank spots on the map, will most certainly be filled with other resource extraction industries such as mining, logging, and other less sustainable forms of commercial fishing. In many cases, the ensuing development will be one that lessens fisher communities' connection with marine resources, as younger members of the community are lured to cities with notions of employment, a mobile phone, a moped, and the other opportunities afforded by modernity. In the worst cases, the environmental impacts of resource extraction at the hands of foreign entities with no long term stake in the area destroys the reefs through destructive fishing practices, clear-cutting, or any number of other environmentally unsound practices. The end result is too often a forced abandonment of a longstanding healthy relationship between humans and reef resources.

Fishing is a way of life for many coastal villages in smaller developing island nations. Certainly fishing provides food, but I have also seen how it provides a social milieu – a complex tapestry with threads reaching far back into past generations and deeply into cultural understandings of religion, philosophy, and environmental stewardship. I have a carved tuna on the wall in my office that I was given while researching aquarium fisheries in Solomon Islands.

Collecting fish for the marine aquarium trade in Solomon Islands.

Villagers in Marau Sound, Solomon Islands, who have made nearly all of their income from mariculture and wild harvest for the marine aquarium trade.

The tuna, carved from dark wood, is speckled with shell inlay that, it was explained to me, glimmer and flash when illuminated by firelight. "The fish, they come alive and remind us," I was told by an elder showing me similar fishes mounted inside a ceremonial structure. To say that fishing is near-essential to many fishing communities is to say something far more profound than reiterating the fact that fish provide over half of the animal protein consumed in many developing island nations. Remove fishing and, to put it quite bluntly, everything changes.

WHEN CULTURES COLLIDE

I once visited a village in Papua New Guinea where there were three villages in close proximity. One village was primarily focused on hunting, another on gardening, and the third, the one I visited, on fishing. Up until very recently, there was no real monetary system in any of these three villages, with transactions being almost entirely handled through bartering – fish for vegetables, vegetables for meat, meat for fish, and so on. The isolation of the villages, combined with their relatively small population in contrast to the amazingly rich biodiversity and biomass in the surrounding jungle and sea, insured that this closed system functioned to the point where it bordered on the utopian – at least that is the way it looked to the few outsiders who experienced it. But the world is increasingly smaller owing to the great weight of globalization aided and abetted by technology. These remote villages like the one I visited in Papua New Guinea will not remain closed systems forever, and how they develop is ever more tied to the decisions we make at the point of sale when purchasing everything from paper products to seafood to aquarium animals.

Aquarium fishes shipped from the smaller developing nations are more likely to be sustainably collected – Image of the WSI facility in Fiji.

As the more remote developing island nations take their first tentative steps into global markets, there are a plethora of pitfalls and perils waiting at every decision point along the road to so-called development. Sometimes these dangers arise as a result of the

Aquarium fishers working in the Indonesian marine aquarium fishery off the northwest coast of Bali.

unexpected. Often they come as a consequence of overly optimistic NGOs or well-intentioned do-gooders who lack full understanding or the staying power that only comes through consistent funding. Sometimes, however, the dangers are more insidious. Sometimes they come in the form of a company representative who may or may not have the village's best interests at heart. I've met such people – often overdressed and looking ill-at-ease amongst the pungent churn of daily life in a place like Port Moresby, Honiara, or Luwuk. Foreign representatives of resource extraction companies look at these islands and see profits in their timber, their fish, and their mineral deposits. With governments that are frequently on the verge of political instability and financial unsustainability, the potential short-term monies offered by these foreigners too often eclipse the few voices who express concern about the social, economic, and environmental impacts of such extractions.

One of the saving graces for some of these developing island countries is the role of customary fishing rights and traditional resource ownership. Resource ownership – the idea that a village owns its adjacent forest and reef and therefore directs its management when it comes to resource extraction – necessitates that those overly dressed, ill-at-ease company representatives make the often convoluted trip to the remote villages themselves to sit with the chief and broker the deal. The government cannot, in most cases, simply issue a permit to the foreign entity to extract resources without the express permission of the village. In Fiji, for example, this works reasonably well because the system, locally known as the qoliqoli system, insures resource management is largely (though not always) a collaborative process between the central government and those who live on, operate in, and know the specific areas best. Similar systems exist in other smaller developing island nations as well. In places that have remained more remote than Fiji with its booming tourist trade, the meeting between company man and elder might be almost as humorous as a scene out of *The Gods Must be Crazy* if the stakes were not so high.

In a village such as the one I visited in Papua New Guinea with no real history of a monetary system or connection to the outside world, it is hard to imagine how a lump sum payout for the rights to log a forest or fish a reef are put into context on a local level. I had the experience of once seeing the site of an abandoned village – a village that had brokered such a deal with a logging company only to have the run-off deposit silt in the reef during the next rainy season. The reef died, the fishing went to hell, and the villagers eventually had to move. My first reaction was visceral – envisioning a kind of eco-terrorism response not unlike Edward Abbey's *Monkey Wrench Gang* in the face of the onward march of so-called progress. My next reaction, which I tried to temper by recalling my developed world perspective, was to try to comprehend why the village had sold the logging rights in the first place. I mean, they must have had an inkling that removing the forest would have consequences. A few nights later, during an interview with a village chief, I began to understand.

"A thing does not go away," he told me. And I realized what he was saying was undoubtedly true in the village's collective experience. The size of the village in contrast to the natural resources surrounding it insured even the most environmentally insensitive local actions would barely have a perceptible impact. In short, no one in the village could envision an impact so great that the forest and then the reef would disappear.

WE ARE THE PROBLEM

The marine aquarium trade can be a resource extraction industry unlike so many others. When well managed, it can provide appropriate socio-economic development and economic incentive to conserve the increasingly embattled reefs of developing island nations across the Indo-Pacific. Sustainable, well-managed aquarium fisheries, as well as source country mariculture and aquaculture initiatives, keep fishers connected to the resource. These fisheries can provide some of the best return on investment for local fishers who increasingly are being faced with making decisions about income and investment, employment, and their future.

Unfortunately, the vast majority of marine aquarium animals available at your local fish store and online are not being sourced from these fisheries. The marine aquarium trade – too often in the absence of appropriate business plans, sufficient capital, and basic fisheries knowledge – relies on cheap fish acquired from fishers

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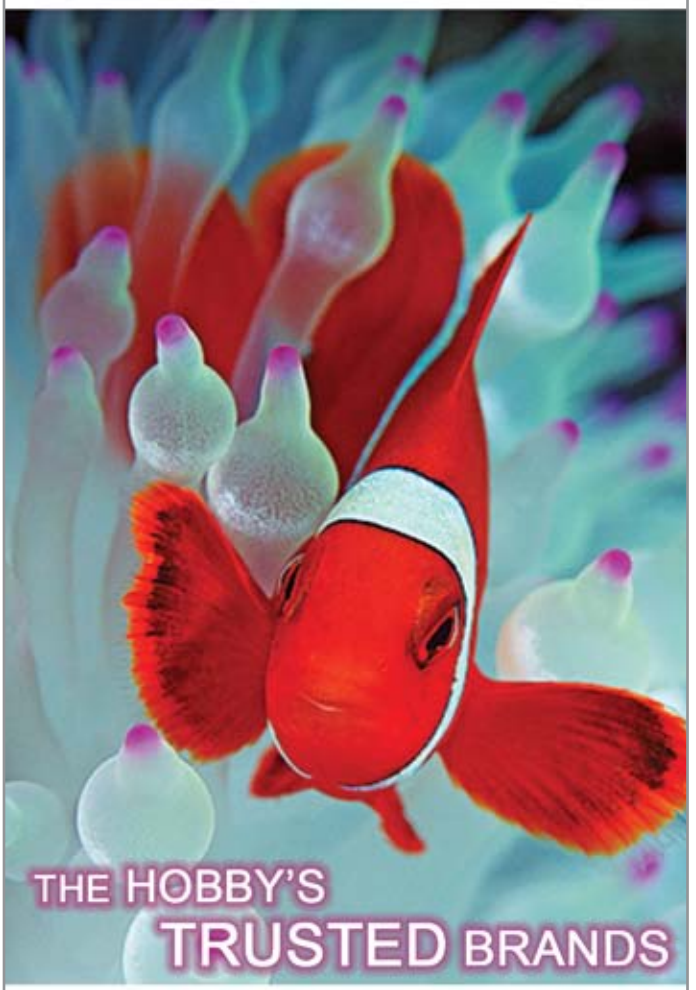



Aquarium fishers commonly spearfish for some of the same fish harvested for aquaria.

using destructive fishing practices like cyanide. These practices hasten the destruction of marine habitats. I have seen it first hand, and it is sickening. I have seen fishers bring an entire coral head to the boat and shake it upside down until all the tiny Blue Hippo Tangs flop onto the deck. I have watched fishers stomp on reef structures while setting up barrier nets. I have seen the bycatch resulting from the use of chemicals to catch fish. I can understand why those who have seen this – those who know the real impact – believe that the best solution is to shut it down.

But shutting down the marine aquarium trade is the other end of the spectrum. Shutting it down means aquarium fishers will turn to other sources of income. I know fishers in Papua New Guinea who, when no longer able to fish for the aquarium trade, turned to the incredibly lucrative black market in beche-de-mer, or sea cucumber. I know of other aquarium fishers who have reverted back to dynamite fishing for food fish in the absence of aquarium trade income.

I recently moved to Maine with my wife, where I frequently cover food fisheries. I often tell people it is difficult to imagine a better time to be a journalist covering fisheries issues in New England, given how dire the situation currently is. More than 70 percent quota cuts for some species has, not surprisingly, impacted fishers directly, but it has also impacted fishing communities, or as we commonly refer to them, working waterfronts. The working waterfronts of developing island nations look quite different than those of New England, but the impacts of losing a fishery on a community are heart-wrenchingly similar.

The solution to the well-documented problems on the collection side of the marine aquarium trade is not to shut it down, nor is it to rely fully on captive bred animals. While I believe we need to continue the very impressive work that has been done as of late when it comes to breeding marine aquarium fishes in captivity, I do not think captive breeding should supplant wild collection. I recently wrote an article about freshwater aquarium fisheries in India and some troubling data presented in a recent scientific paper showing that illegal wild harvest of endangered species is far more common than most people would think. The response proposed by many readers is to make sure these endangered aquarium fishes from India are sourced from fish farms, most of which are located outside

of India. A few of the people I interviewed for the story, however, lamented this reliance on fish farms located in other countries and the potential impact to Indian fishers, the ecosystems in which they fish, and the species themselves. I had a similar conversation with an exporter in Solomon Islands once who referred to the breeding of coral reef fishes and propagation of corals in market countries such as the United States as nothing short of biopiracy. In both the cases of India and Solomon Islands, the suggestion was that, from a socio-economic and environmental perspective, people underestimate the importance of keeping at least some of the revenue generated by the fishes in the countries to which the fishes are indigenous. Whether this happens through establishing sustainable aquarium fisheries or local mariculture and aquaculture operations, an essential component to creating economic incentive to conserve is providing the economic incentive locally.

WE ARE ALSO THE SOLUTION

Opinions regarding biopiracy aside, the model for how a well-managed, sustainable aquarium fishery can be a win-win for fishers and fishes is well documented. Project Piaba is the stand-out example in the freshwater aquarium trade, and while not as sophisticated or well documented, many of the marine aquarium fisheries in the smaller developing island nations of the Indo-Pacific have established a model that can be replicated across all fisheries. This will only happen, however, if aquarists embrace the desire for change. While there will always likely be a majority of marine aquarists who will look to purchase the least expensive animal, what the saltwater aquarium trade needs is a vocal and well-informed minority willing to use their purchasing power and influence through local clubs, the aquarium media, and the like to advocate change. Seeking out animals sourced from smaller developing island nations, asking questions about the chain of custody between reef and reef tank, and being willing to pay more for a healthy animal imported via a more transparent supply chain where both fisher and reef benefit from the transaction are just a few of the actions any aquarist can take today. Supporting captive breeding and the ongoing work to unlock the mysteries of successfully breeding and rearing coral reef fishes in captivity remains an essential part of the equation, but not when it is to the exclusion of remaining connected to the actual reefs and inhabitants of fishing villages on the other side of the globe.

Scott Fellman is just one of many U.S.-based importers with an interest in providing eco-labeled fishes to North American aquarists.

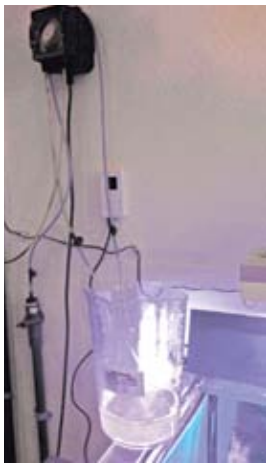
SHRIMPFISHES
UNCOMMON, BIZARRE, AND EASY?

MATT WANDELL

Shrimpfish are some of the most bizarre and unique fish that an aquarist can keep. A school of individual fish that swim in formation like a flock of birds makes a captivating sight in an aquarium. Unfortunately, shrimpfish are rather uncommon in home aquariums, despite being relatively common in the wild and having a fairly straightforward husbandry regimen.

Let's start out with the basics of biology in case you are a fish geek like me and care about this kind of stuff. Shrimpfishes are found in the order Syngnathiformes (along with seahorses, pipefishes, ghost pipefishes, sea dragons, sea moths, and trumpetfishes) and have a long, tubular snout that they can quickly snap at their intended prey. The common name of shrimpfish is usually applied to four species in the genera *Aeoliscus* and *Centriscus*. All four species have long, highly-compressed bodies and swim in a vertical orientation almost all the time. Their bodies are completely encased in armor-like plates that make them totally inflexible. On the ventral side, these plates form a thin, sharp edge, which is why these fishes are sometimes called razorfishes. If you're wondering why they're called shrimpfish, your guess is as good as mine. I've searched far and wide to figure out the etymology with the best guesses seeming to be that they move or look like shrimp, even though to my eye, they don't move or look like shrimp at all. Regardless, the name shrimpfish has stuck and is the most commonly used name for these fish in the aquarium trade.

The two species of *Aeoliscus* can be distinguished from the two species of *Centriscus* by the presence of a joint or hinge at the end of the first dorsal spine, which appears where you'd expect the tail



A simple auto feeder can be used to dose baby and adult *Artemia* for a few hours every day.

to be in most other fish. In *Centriscus*, this spine is fixed and cannot bend. This difference is pretty much academic because the care and behavior for either genus is virtually identical.

The genus *Aeoliscus* seems to be far more common in the aquarium trade than *Centriscus*. Both genera are widespread, occurring from South Africa to Japan. Shrimpfish are found in relatively shallow water (usually less than 100 feet deep) in seagrass beds, coral reefs, and shipwrecks. Although they may use the spines of large *Diadema* urchins or seagrass as cover, this relationship is certainly not obligate; I have seen *Aeoliscus* associated with *Antipathes* black corals and hovering under large sponges in the wild. If they are startled, shrimpfish can give up their usual vertical swimming orientation to make a surprisingly fast getaway by swimming horizontally. Juveniles will congregate in groups of several hundred individuals, while adults may form smaller groups or pairs.

In captivity, shrimpfish are a great addition to a large community reef tank. Despite many resources that indicate otherwise, shrimpfish do not need a dedicated species tank, a seagrass biotope, or a low-flow tank. These fishes are found on coral reefs with high flow in the wild and feel right at home in a typical high energy SPS reef aquarium. Furthermore, they do not require any special considerations regarding fish tankmates; tangs, angelfish, and small wrasses will all get along fine with shrimpfish. Most

Shrimpfish can be kept with most peaceful community reef fish, like this pencil wrasse (*Pseudojuloides cerasinus*).

fish tend to completely ignore shrimpfish and vice versa. The biggest challenge in keeping these fish thriving is satisfying their feeding requirements. Shrimpfish prey on very small crustaceans all throughout the day, and in captivity, at least initially, this is time consuming to replicate.

In my role as a biologist at the Steinhart Aquarium, I've had the opportunity to personally oversee the quarantine period for about 60 shrimpfish, many of which are still on public display years later. Nearly all individuals will begin eating live baby brine within a day of being in captivity. We use a very simple autofeeder consisting of a gallon jug and a thumbwheel drip line to dose baby brine to the quarantine tank over several hours. There is an air bubbler in the jug and a small amount of phytoplankton to keep the baby brine shrimp well fed. Adult brine shrimp tend to be ignored for the first couple of weeks, especially by smaller individuals, so I would not rely on this as a viable first food. Cyclop-eeze tends to be taken fairly soon after that, although not as readily as baby brine. I've never tried feeding *Daphnia* or Tigger-pods to shrimpfish as a first food, although I wouldn't be surprised at all if they were readily accepted. If you've got large cultures of these already going, they should work well, but if you're starting from scratch, the easiest way to go about preparing food for shrimpfish is to simply hatch baby brine shrimp. Many articles have been written about decapsulation and hatching baby brine shrimp, so I won't go into great detail about the process here. Hatching brine shrimp from cysts will only take you a few minutes each day. The side benefit of this is that you can use any extra brine shrimp nauplii to feed your corals and other small zooplanktivores. If you have small wrasses or anthias, the best way to get them looking fat and sassy is with a daily drip

This 200 gallon mixed reef aquarium houses 10 shrimpfish (*Aeoliscus strigatus*).

of baby brine shrimp into the tank. Fortunately, you will not need to hatch baby brine for long because shrimpfish will begin to take small frozen foods within a month or two of being in captivity. Hikari mysid shrimp and finely chopped clam and prawn, along with a bit of Cyclop-eeze, make a good balanced diet for your shrimpfish. Ideally, they should be fed two to three times per day. Of course, the occasional drip of baby brine will still be appreciated as well, but it is certainly not necessary to keep this up as a daily routine once they are accepting larger food items.

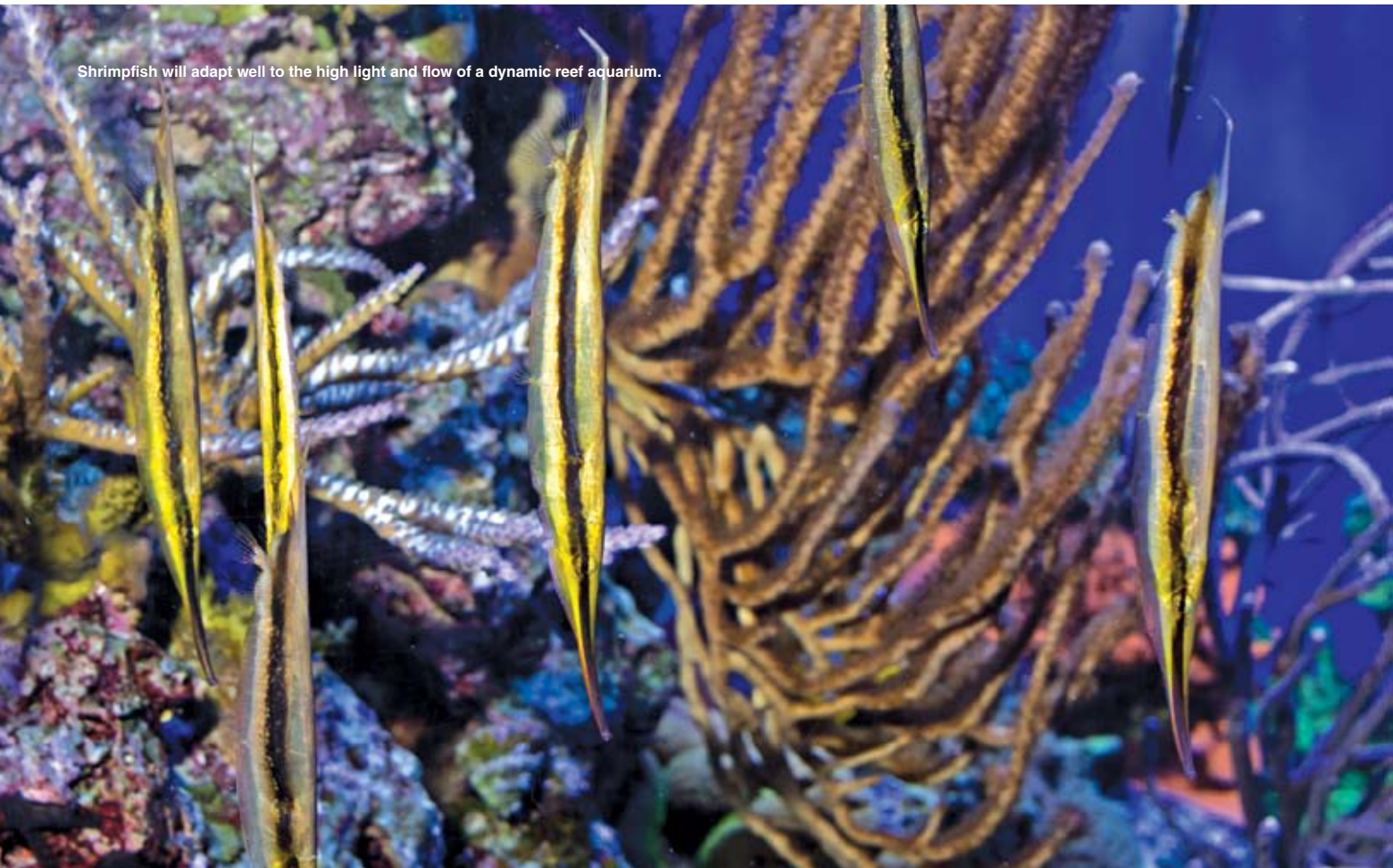
One of the other difficulties in acclimating shrimpfish to captivity is that, at least for the first few weeks, they seem rather susceptible to bacterial infections; however, these are easily preventable. Generally, I follow a pretty strict principle of not treating new fish prophylactically during quarantine, and I simply do water changes until there is some good evidence that a parasite is present. No single treatment is

effective at killing all fish pathogens, so identification of a pathogen is crucial before deciding what course of treatment to begin. The one exception to this that I follow is to begin treatment of shrimpfish with nitrofurazone within 2 to 3 days of their arrival. It does not appear to have any negative effect on their behavior or feeding and significantly reduces mortality. Over the years, we've quarantined many batches of shrimpfish, and I can't recall a single time when we've identified a common pathogen like *Cryptocaryon*, *Uronema*, or monogeneans on them. Perhaps this is because of their unique armored shell, or perhaps we are just incredibly lucky, but a significant percentage of mortalities within the 2 to 3 week range (with no obvious cause) were commonplace. I now quarantine them in a tank with nitrofurazone added that is re-dosed once weekly after a 25% water change. I find that this reduces these unexplained deaths to nearly zero. Does this mean they were dying from bacterial infections? Unfortunately, determining the cause of death of an animal the size and thickness of a potato chip is not very easy, so we cannot say that with absolute certainty. However, it does appear that prophylactic treatments of nitrofurazone are beneficial during the quarantine period.

After 30 days of quarantine, your shrimpfish should be ready to be moved into a permanent tank, and they should adapt well to nearly any typical reef aquarium. I don't like to use a net with these guys; instead, a bag or large clear container should be used to catch and move them. The largest individuals get about 6 inches long in captivity, so I'd recommend a tank no shorter than about 24 inches as their permanent home. If the tank has a large branching gorgonian, it will make a nice home base for the shrimpfish until

A shrimpfish using its long snout to capture prey.

they become comfortable cruising around the entire tank. Small groups can and should be formed; a group of 6 to 8 individuals in a tall 90 gallon aquarium is a good stocking density. As shrimpfish get older, they will begin to form a dominance hierarchy, and stocking too densely can lead to mortalities. As with any group of fish, a tank with lots of vertical structures, hiding places, and strong water motion, along with frequent feeding, tends to distract the fish and diffuse aggression. Eventually, shrimpfish will begin cruising around the tank and will pick small crustaceans out of the water and off of the glass and rocks. They use their long snouts to target crustacean prey deep inside branching coral heads, and I've seen them poking into and feeding inside large colonies of *Acropora*. One intriguing potential of their feeding behavior is that they may be predators of the dreaded red bugs and/or *Acropora*-eating flatworms (AEFW). Speculation alert – I have no firm evidence to demonstrate that they eat either of these pests, but it certainly seems like a possibility. I take care of a 200g tank with shrimpfish and lots of *Acropora*. These two pests have certainly been introduced in the past but are no longer present in high enough numbers to produce any symptoms in the corals, despite no treatment or intervention on my part. This could, of course, be an entirely happy coincidence, and the corals could simply have shaken off the pests all on their own. Please do not go out and buy shrimpfish because you have one of these pests and I wrote that they might eat them. You should get shrimpfish because they're awesome and because you've prepared your tank for them. But if you do get some and also happen to have these pests in the tank, careful observation and reporting on this point may be of benefit to the hobby community.



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A 500G MISSOURI MASTERPIECE

DAVID HURD

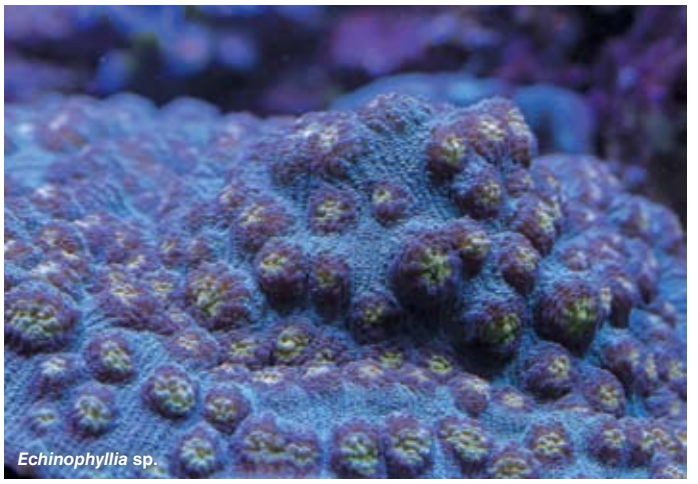
Hello, my name is David Hurd, and I'm a reefaholic. I live in Northwest Missouri, and I've been honored to have my tank featured on my local reefing forum as well as in local newspapers. I try to share my experience with reef keepers of all ages and expertise; I've also donated corals and time to an elementary school and two universities. To me, the greatest part of this hobby is that we are all equal. It doesn't matter if you have a 500 gallon aquarium or a 5 gallon nano; we all get to see our fish and corals eat and grow, and we all have to change our water and keep our parameters in line. We do this because the number one goal of a true aquarist is to provide the best environment possible for the animals.

My first experience with saltwater aquariums was back in 2009. Karen, my wonderful wife of 26 years, took me to a local fish store and got us hooked – no pun intended. I didn't wait long before getting my first tank, a 220 gallon display stocked with hardy fish and soft corals. It only took 6 months for me to get the Small Polyp Stony coral (SPS) bug. After seeing several people's SPS tanks, I knew I had to have one. I then purchased a 125 gallon aquarium and designated it as SPS-only. I soon outgrew the 125 and finally, in December of 2011, I purchased my 500 gallon tank.

My 500 gallon display has a center overflow and measures 109"x40"x27". Lighting for the main display consists of 12 EcoTech Marine Radions (first generation). The lights are on for 12 hours a day, ramping up and down to simulate a natural light cycle as

closely as possible. I also have a 140 gallon frag tank that measures 100”x18”x18”. The frag tank is lit by four EcoTech Marine Radions. The life support system includes two 100 gallon Rubbermaid stock tanks and a 33 gallon refugium. The return flow is controlled by two Iwaki external pumps, moving roughly 1,800 gallons per hour. Inside the main display are two EcoTech MP60s, two EcoTech MP40s, and two Hydor Koralia 3250s. I utilize the Neptune Apex controller to help monitor pH and temperature as well as control my lights and all my powerheads. The controller is set to completely randomize the flow inside the tank. The Apex also runs my dosing pumps and reactors.

The concept behind my aquascape is simple. My family and I like to watch fish swim in, under, and around structures, so we decided to create as many caves and overhangs as we could. During the build, our main goal was to have as little rock touching the starboard



Echinophyllia sp.

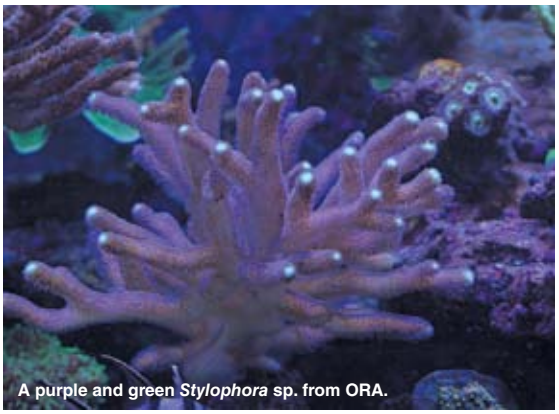
Jason Fox Gold Meister Chalice.

bottom as possible. This created many large caverns and mazes. I also handpicked odd-shaped rocks for the display.

To maintain proper parameters, I use a GEO 818 calcium reactor, a Super Reef Octopus XP 8000, two MF2000 media reactors (one for carbon and one for granular ferric oxide (GFO)), and a SpectraPure MaxCap UHE 100 gallon per day RODI unit. My maintenance routine is simple and can be summed up in two words – water changes. I stay on my water change schedule like clockwork. Often, people who come over to see my aquarium will ask me what my secret is. They are usually looking for some miraculous chemical additive or elaborate scheme; all I can tell them is that I keep up on water changes. I do supplement calcium, magnesium, and soda ash, but other than cleaning the glass and changing the water every 2 weeks, the tank stays clean. I also have a large cleanup crew of various snails, crabs, and conchs.

I think my favorite part of this hobby is the people I meet. It's really nice to see new faces and watch people get excited the first time they see my reef tank. I have been able to share this passion with


This orange cap has grown well under the Radions.


A purple and green *Stylophora* sp. from ORA.


Stylophora sp.

Twelve EcoTech Marine Radions provide ample light for the display.

Randy McIntosh placing rock to create the desired aquascape.

my family, and I have made countless friends with people from my area and even across the world. Sharing my goals, experiences, and plans with other reefers has helped me save time, money, and most importantly, animals' lives.

Over the last 5 years, I have grown some beautiful, show-sized colonies from the smallest of frags (some as small as a quarter of an inch), and they have truly become part of the family. Corals and fish alike get names from my wife, my children, and me. This closeness makes losing livestock the hardest part of this hobby.

This is a special *Porites* sp. from Jason Fox that I purchased at MACNA 2011.

Left-side view

My fish list includes the following:
-15 tangs (Achilles, Blonde Naso, Chevron, Convict, Kole, Lavender, Mimic Lemon Peel, Mimic Eibli, Orange Shoulder, Sailfin, Scopas, Tomini, Blue Unicorn, Vlamingii, and Yellow)
-7 wrasses, 4 cardinals (2 Spotted PJ, 2 Banggai), 2 clowns, 1 firefish, 1 Green Mandarin, 1 Black Blenny, and 1 Green Chromis.

The list of my individual coral species and morphs is extensive, so I'll just mention a few favorites. To scratch the surface, there are three main colonies of staghorn corals: blue, green, and purple. I have two large colonies of *Montipora* caps: one is green with a purple rim and the other is a red cap. I also have a large colony of Chili Pepper and Superman Montipora. I have three large colonies

Right-side view

of *millepora* corals: blue, green, and red. The most abundant corals in my collection are *Acropora*. My *Acropora* specimens also include Red Planet, *caroliniana*, Bonsai, and Green Slimer. I also have several encrusting corals and an assortment of zoanthid polyps.

As you can imagine, feeding this beast of a tank is a chore. I very likely over feed, but I would rather over feed and make my protein skimmer work harder than under feed and starve the fish. My routine consists of three feedings daily. I use a homemade blend of shrimp, squid, krill, nori sheets, phytoplankton, and garlic. I also use nori sheets in a veggie clip on the glass.

I hope you enjoyed learning about my tank and addiction. It truly is a passion of mine. Please remember that this hobby isn't about having the biggest and best equipment; it's really about providing the best environment for the animals. Again, my name is David Hurd, and I'm a reefaholic. If you would like to know more about my system or ask me questions personally, you can check out my build thread on Reef Central under the username David00061.

Unidentified *Acropora* sp.

This pink *Acropora* colony is over 13" wide.

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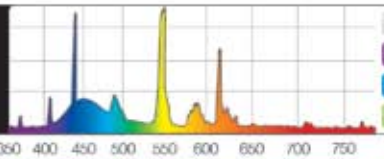

Ultra Violet	300-399.5	3.22%	Yellow	541-590.5	25.59%
Violet	400-440.5	16.66%	Orange	591-650.5	13.94%
Blue	441-490.5	25.79%	Red	651-700.5	1.84%
Green	491-540.5	10.53%	Infrared	701-780	2.44%

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Available in: 24" 24w
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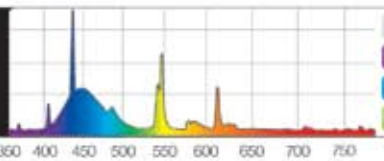
Blue-tinted light caters to the biological requirement of mid-water corals and aesthetic appeal of the fish

Blue color compliments purple and actinic light to create custom colors

Spectral Distribution



Ultra Violet	300-399.5	2.96%	Yellow	541-590.5	14.94%
Violet	400-440.5	24.79%	Orange	591-650.5	8.66%
Blue	441-490.5	37.76%	Red	651-700.5	1.33%
Green	491-540.5	7.50%	Infrared	701-780	2.05%

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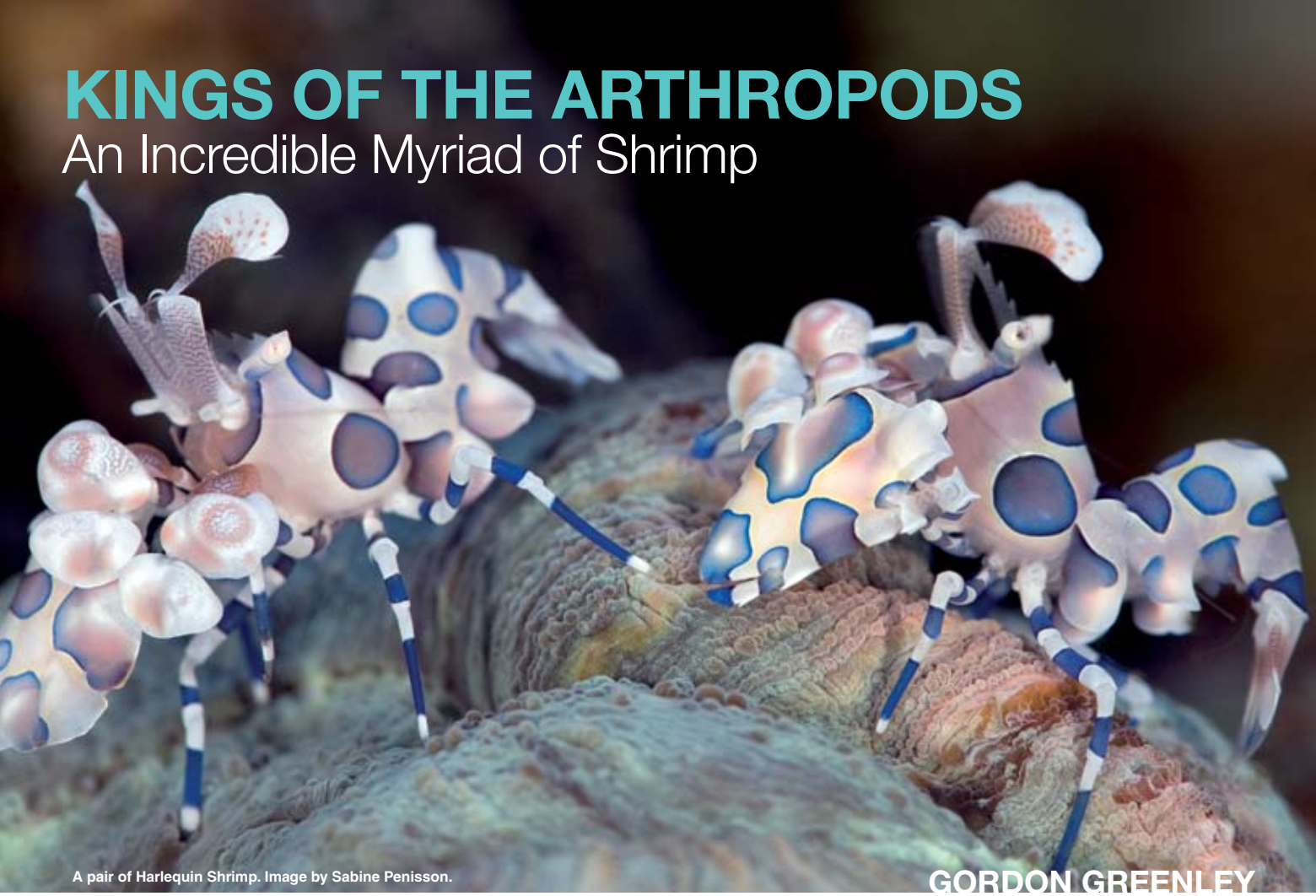


A pair of Harlequin Shrimp. Image by Sabine Penisson.

GORDON GREENLEY

When most people think about a coral reef or a reef aquarium, they imagine the colorful fish and coral and the exciting, high-energy environment. However, people do not generally think of one of the most interesting groups of creatures that inhabit coral reefs: shrimp. Closely related to insects and arachnids, shrimp add an interesting diversity to any reef aquarium. Although many people think of them only as food, shrimp can make exceptional pets with the right care. As is the case with many marine animals, shrimp are somewhat delicate. They are intolerant of a number of chemicals, and the presence of heavy metals (such as copper) in their water is usually fatal. Shrimp can even be sensitive to normal aquarium water parameter swings if they are too large or occur too quickly. There are numerous species available in the aquarium trade that can be kept in a reef aquarium. Some have extremely interesting and distinctive behaviors such as cleaning fish, living as commensals in corals and sponges, or sharing burrows with gobies. The following article will describe some of the common and not so common species encountered in the trade and their basic care and behavior.

CLEANER SHRIMP

The various species of cleaner shrimp are some of the most often encountered shrimp in the aquarium trade today. Their fascinating behaviors and vibrant colors and patterns are favorites among reef aquarists. Many different shrimp species are considered cleaner shrimp. Some of the most common are Skunk Cleaner Shrimp (*Lysmata amboinensis*), Blood Shrimp (*Lysmata debelius*), Coral Banded Shrimp (*Stenopus hispidus*), Golden Coral Banded Shrimp (*Stenopus zanzibaricus*), Blue Coral Banded Shrimp (*Stenopus tenuirostris*), and Peppermint Shrimp (*Lysmata wurdemanni*). Some commensal *Periclimenes* shrimp (such as Pederson Shrimp (*Periclimenes pedersoni*) and Yucatanicus Shrimp (*Periclimenes yucatanicus*)) and some shrimp in the *Urocaridella* genus are recognized as cleaner shrimp, though they are also considered anemone shrimp.

Blood Shrimp (***Lysmata debelius***). Image by Tim Wong.

Skunk Cleaner Shrimp (***Lysmata amboinensis***). Image by Sabine Penisson.

Cleaner shrimp get their name from the fact that in the wild, they are known to clean fish. This cleaning consists of the shrimp crawling along the body of a fish and even entering the fish's mouth and gills in order to remove parasites and dead skin. This is most often seen with Skunk Cleaner Shrimp. In the wild, they will set up a cleaning station where they hang upside down in a cave or under a rock ledge and fish will seek them out for their services. Skunk Cleaner Shrimp have even been observed cleaning inside the mouths of moray eels. Most fish will not eat cleaner shrimp because they know the shrimp provide them with an important service. In this mutualistic relationship, the fish gets cleaned and the shrimp gets a meal.

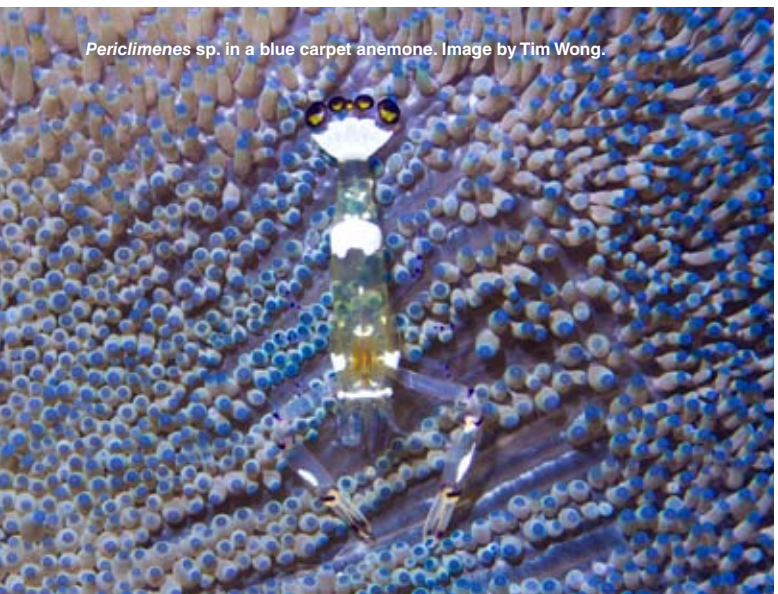
Skunk Cleaner Shrimp are one of the most colorful and active shrimp available in the aquarium trade. This species is red and yellow with a white stripe running from head to tail and occurs throughout the Red Sea and Indo-Pacific. They can live for over 2 years and grow to about 3 inches in length. Because they are hermaphrodites, any two individuals who are put together can form a pair. It is a common misconception that one must purchase cleaner shrimp as a "true pair." Although the cleaning behavior of Skunk Cleaner Shrimp is

Coral Banded Shrimp (*Stenopus hispidus*). Image by Tim Wong.

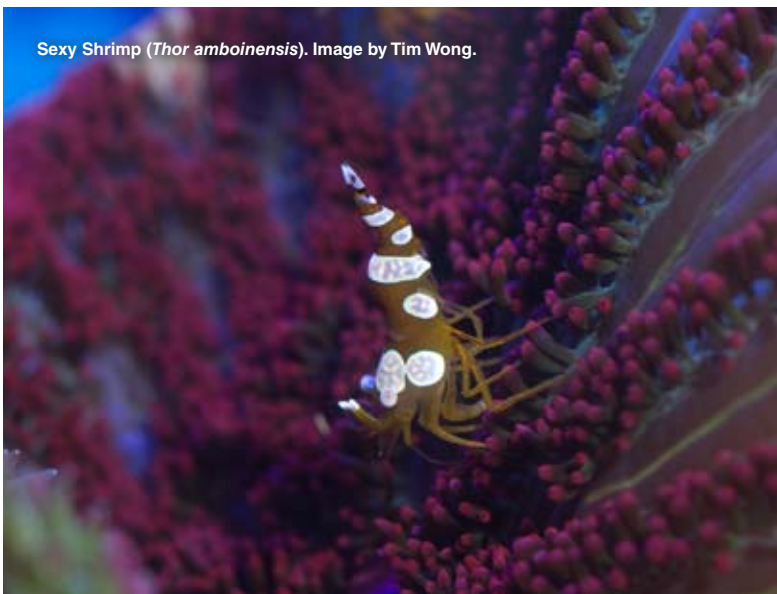
not always observed in the aquarium setting, they can still live quite happily, acting as scavengers and eating almost any foods fed to the fish and other inhabitants. It is also not uncommon for them to clean human hands or arms which are introduced to the aquarium. Almost all cleaner shrimp are peaceful, even with other shrimp; however, there are three exceptions: the Coral Banded Shrimp, Gold Coral Banded Shrimp, and Blue Coral Banded Shrimp. All Coral Banded Shrimp tend to be somewhat aggressive and intolerant of other species of shrimp. They have been known to fight with or kill other shrimp and even some slow-moving fish such as seahorses. It is best to keep any Coral Banded Shrimp in an environment without other types of shrimp or slow-moving tankmates.

ANEMONE SHRIMP

Anemone shrimp as a group have commensal relationships with different species of sea anemones. Some species of anemone shrimp which are commonly found in the trade include Sexy Shrimp



Periclimenes sp. in a blue carpet anemone. Image by Tim Wong.



Sexy Shrimp (*Thor amboinensis*). Image by Tim Wong.

(*Thor amboinensis*), White Spotted Anemone Shrimp (*Periclimenes brevicarpalis*), Pederson Shrimp (*Periclimenes pedersoni*), and Yucatanicus Shrimp (*Periclimenes yucatanicus*). In the wild, anemone shrimp are never found without a host anemone because they would not survive being hunted by predators. Anemones provide all species of anemone shrimp with protection and some with a food source. Certain anemone shrimp, such as the White Spotted Anemone Shrimp, are even parasitic on the anemone and eat parts of the living anemone itself. Anemone shrimp are typically only found singly or in pairs, with a maximum of one pair per anemone. In the aquarium, anemone shrimp should always be kept with a host anemone for protection. Without an anemone, they are very vulnerable to opportunistic predators. Anemone shrimp are peaceful towards other tankmates, including other shrimp. They will usually accept a wide range of meaty foods, but it is suspected that they may also acquire some special nutrients from their host, either from the anemone's slime or tissue. If an anemone is provided, anemone shrimp typically will never stray more than a few inches from their host; however, they can still be preyed upon by voracious fish.

One of the more unique species of anemone shrimp in the hobby is the Pederson Shrimp. They are found throughout the Caribbean and grow to approximately 1.75 inches in length. Pederson Shrimp are mostly transparent with blue and white stripes and have been known to act as cleaner shrimp. They are slow and often shy and are best kept with a large anemone in a tank without boisterous fish. They also should not be kept with anemone fish (clownfish) unless more than one host anemone is available.

Bongo Shrimp (*Phyllognathia ceratophthalma*). Image by author.

STARFISH-EATING SHRIMP

Starfish-eating shrimp are unique in that they mostly (and in some cases, only) consume starfish. The starfish-eating shrimp species include Harlequin Shrimp (*Hymenocera elegans*), Bumblebee Shrimp (*Gnathophyllum americanum*), and Bongo Shrimp (*Phyllognathia ceratophthalma*). The Harlequin Shrimp only feeds on starfish while the Bumblebee Shrimp will sometimes accept meaty foods as well. Bongo Shrimp are very picky, usually only feeding on micro starfish such as *Asterina* spp. and micro brittle starfish. It is of the utmost importance to keep plenty of food available for starfish-eating shrimp or they will slowly starve. Starfish-eating shrimp are mostly nocturnal but can sometimes be seen during the day. The

Tiger Pistol Shrimp (*Alpheus bellulus*). Image by Sabine Penisson.

Bongo Shrimp is both a much rarer and more cryptic starfish-eating species encountered infrequently in the trade. They are also intensely captivating. Bongo Shrimp are orange, black, and white and sometimes have tiny blue spots. They grow to about ¾ of an inch in length and are best kept in nano or pico aquariums. Due to their small size, Bongo Shrimp often get lost in large aquariums. This species occurs throughout Indonesia in the Pacific Ocean and are often found moving slowly in or around sponges. Although they are capable of great bursts of speed, they cannot be kept with any fish that has a big enough mouth to consume them. They should also never be kept with other aggressive invertebrates such as large crabs. Bongo Shrimp can be kept in groups; however, they may fight. A fight consists of very slowly pushing one another's claws out of the way. Fights may be amusing, but they can cause real damage to the shrimp. It is best to keep Bongo Shrimp singly or in established pairs.

PISTOL SHRIMP

Pistol shrimp are very different from most other species of shrimp in that they burrow and have the ability to stun and kill their various prey without ever touching them. Most pistol shrimp are in the Alpheidae family and *Alpheus* genus and are found all over the world. Pistol shrimp get their name from their particular ability to snap their modified larger claw in order to injure prey or predators. The snap is so powerful that it creates a microscopic bubble which shoots out of the claw towards its target. The bubble moves so fast that scientists have recorded the sound to be about 218 decibels, comparable to the sound of a gun-shot. The temperature inside the micro-bubble has been reported to reach approximately 4,700ºC, which is nearly the temperature of the surface of the sun (approximately 5,500ºC). The most common species in the trade are Randall's Pistol Shrimp (*Alpheus randalli*), Tiger Pistol Shrimp (*Alpheus bellulus*), Anemone Pistol Shrimp (*Alpheus armatus*), and Bull's Eye Pistol Shrimp (*Alpheus soror*). A more rarely encountered species is the Red Spotted Pistol Shrimp (*Alpheus rubromaculatus*). Almost all pistol shrimp live in underground burrows with extensive networks of tunnels, which they constantly and almost obsessively rearrange and restructure.

Some pistol shrimp, such as the Anemone Pistol Shrimp, form mutualistic relationships; in this case, it is with the Curly-Q Anemone (*Bartholomea annulata*). On the other hand, the Bull's Eye Pistol Shrimp lives a solitary life. Most commonly, however, pistol shrimp such as Randall's Pistol Shrimp, Tiger Pistol Shrimp, and Red Spotted Pistol Shrimp form mutualistic relationships with certain species of gobies. Pistol shrimp have very poor eyesight, mostly seeing light and shadows. They have a specialized set of antennae which are kept touching the goby at all times. By sharing a burrow with a goby, the shrimp can be alerted to predators by feeling the goby retreat into the burrow when a predator is near. The goby will often bring food into the burrow for the shrimp as well. In turn, the shrimp provides protection for the goby and a place to live.

One of the most common species in the trade, the Randall's Pistol Shrimp, is red, white, and yellow and grows to about ¾ of an inch. It is found in the Indian Ocean and around the Seychelles Islands. It will pair with almost any species of shrimp goby and as with all pistol shrimp, adapts quickly to aquarium life. Pistol shrimp are one of the most interesting types of shrimp available and provide endless entertainment in the reef aquarium.

OTHER SPECIES OF INTEREST

Several other intriguing species of shrimp found in the aquarium trade include Emperor Shrimp (*Periclimenes imperator*), Camel Shrimp (*Rhynchocinetes durbanensis*), and Saron Shrimp (*Saron marmoratus*).

Emperor Shrimp are one of the most specifically adapted commensal shrimp in the sea. They are orange, purple, and white and are commensal with certain sea cucumbers, sea slugs, or nudibranchs on which they live and ride. They occur widely

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throughout the Indo-Pacific and grow to be about ¾ of an inch in length. They are very slow and are easily preyed upon by fish. In being commensal with sea cucumbers, sea slugs, or nudibranchs, it is suspected that these shrimp feed on the slime of their host and therefore cannot be kept long-term in an aquarium without one. When a host is provided, however, Emperor Shrimp can be kept for many years in captivity. In the aquarium, they will sometimes accept supplements of meaty foods, albeit without vigor. Emperor Shrimp are one of the most beautiful yet difficult shrimp to keep. Due to their extremely specialized need for a host sea cucumber or sea slug, which can be difficult to feed and keep long-term, Emperor Shrimp are best left to only expert aquarists.

Camel Shrimp are very common in the aquarium trade and are often confused with the common and peaceful Peppermint Shrimp. They are found throughout the Indo-Pacific and grow to about 1.6 inches in length. Camel Shrimp are not safe for the home reef environment. They have been known to consume some soft corals such as zoanthids and leather corals and may even nip at some anemones. They are also typically intolerant of other species of shrimp and therefore should be kept alone or in small groups. Despite this, in the right aquarium, Camel Shrimp can make an appealing display. They prefer to hide in caves or sit on the back of rocks and will line up next to each other while feeding, sometimes appearing to push each other around. It is possible that in a group, Camel Shrimp form a social hierarchy. They will accept almost any meaty food and are usually seen picking at the rocks and sand. Camel Shrimp are a beautiful though mostly undesirable species in the aquarium trade.

Saron Shrimp, sometimes referred to as Monkey Shrimp, are another interesting but often undesirable species of shrimp encountered in the aquarium trade. Saron Shrimp are found from the Indian Ocean and Madagascar to the Pacific Ocean and Indonesia. They grow to about 1.25 inches in length or sometimes larger depending on the exact species. They are a mottled green, brown, black, and purple and often have feathery appendages called cirri all over their bodies. Saron Shrimp are very aggressive and destructive and should not be kept with corals or other invertebrates. They are known to eat or destroy almost all types of corals, especially soft corals. Saron Shrimp should be kept in a fish-only aquarium or by themselves. They will accept many types of meaty foods but will also kill and eat other shrimp if the opportunity presents itself. Saron Shrimp are very reclusive, nocturnal, and rarely seen during

Saron Shrimp. Image by Natalie11345.

Emperor Shrimp (*Periclimenes imperator*). Image by author.

the day. Due to their limitations, they are yet another interesting but less desirable shrimp.

CONCLUSION

A true coral reef, in the ocean or in captivity, is incomplete without the presence of shrimp. Shrimp occupy an exclusive niche in nature and therefore exhibit behaviors and characteristics not found in any other group of organisms on earth. Not only do they have interesting personalities, but they are colorful and mesmerizing as well. Some are comical and active like cleaner shrimp, while others are intriguing, smart, and even audible, like pistol shrimp. Shrimp provide a unique, attractive, and attention grabbing focal point that will enrich any coral reef aquarium.

Camel Shrimp (*Rhynchocinetes durbanensis*). Image by Tim Wong.

Image by Sabine Penisson.

ATTEMPTS AT BREEDING THE LYRETAIL ANTHIAS

ALEX JOHNSON

Turn on any documentary about reefs or the ocean, and you will almost certainly see a school of bright orange and purple fish. I think a shoal of Lyretail Anthias (*Pseudanthias squamipinnis*), with the male a stunning, almost iridescent purple and his harem of females shimmering with flashes of gold, is one of the most spectacular sights a reef has to offer. Documentary producers seem to agree. It's often the first glimpse you get of the myriad colors that await as you explore the reef, and it's on my bucket list of things to see before I die.

To say I love Lyretail Anthias is an understatement, but I have often been saddened to see them in captivity with their colors washed out. These fish can be absolutely stunning in a display tank if fed properly, but in tanks with an emphasis on low nutrients, feeding Lyretail Anthias what they require is nearly impossible. These anthias need small but frequent feedings, with the minimum being two to three times per day. When they are in breeding condition, they will spawn every night, so making sure they are well fed is of paramount importance. If you cannot provide these feedings, you should consider a different species.

I acquired my trio, one male and two females, to see if I could breed them in captivity. Obviously, the differences between the adult male and female made them easy to sex, but when it came time to choose the two females, I went for a big one that was almost the same size as the male and one that was much smaller. I wasn't sure if they would fight but thought it would be a good idea to minimize aggression by adding two very different-sized females. It seemed to work, and my trio soon settled down.

In the beginning, I fed them as often as I could with a wide variety of food. They were fed everything I could think of and get my hands on. The list included benthic copepods, newly-hatched baby brine shrimp, my own special mix of seafood with added vitamins and garlic, off-the-shelf flake food, and *Mysis*. They soon colored up, and the larger of the females started showing a very round belly. I

Male *Pseudanthias squamipinnis*. Image by Sabine Penisson.

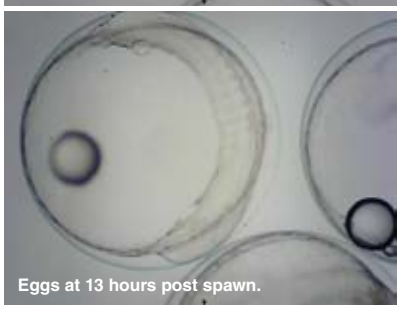
Female *Pseudanthias squamipinnis*. Image by Sabine Penisson.

kept them in a 3-foot-tall tank with a capacity of about 200 liters (~53 gallons). I don't think they can be bred in anything shorter as their spawning rise would see them carpet surfing.

The Lyretail Anthias is a pelagic spawner, meaning the male will release sperm and the female will release eggs at the same time into the water column. Having had experience with Mandarin Fish (*Synchiropus splendidus*) spawning and their almost graceful ballet, I was unprepared for the anthias' frenzied spawning dash.

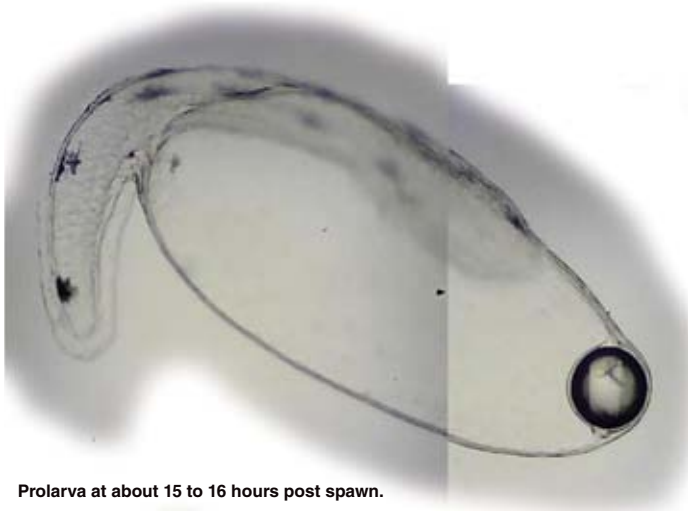
I noticed the male had for some days been a little bit more aggressive with the females. Normally, he would swim around them and chase them in and out of caves. They in turn would chase each other and occasionally the male. This time, he was dive bombing them, fins up and very faint lines showing on his sides. The females were hovering at the bottom of the tank and would occasionally meet him on his U-shaped dive bomb swoop. They too were showing faint lines in their bodies. At first, I thought they weren't getting enough food, but I was soon proven wrong.

Egg at 12 hours post spawn.



Eggs at 13 hours post spawn.

On this particular day, I was waiting for my Mandarins to spawn; the blues was playing on the stereo, and all was quiet in the fish room. The only sound was the gentle hum of the air pump and the flow of water… when I heard a splash. It's amazing how loud something is when you are not expecting it, and I literally jumped out of my seat. Thankfully, the anthias tank is in the same line of sight as the Mandarins, so I was able to see the eggs and sperm being released. I managed to scoop up what I could see into the tub that was supposed to be for the Mandarin eggs. The actual spawning happens very quickly, and if the tank is not tall enough, both fish could end up on the floor. The male will dive bomb the females, and after swimming back up to the surface, he will dive bomb again and again. On some sort of signal, the female will join in when he is going back up, swim next



Prolarva at about 15 to 16 hours post spawn.

to him, hit the surface, flick, and head back down. It happens so quickly that I have missed it on more occasions than I have actually seen it.

The eggs, when collected, are minute. They are certainly less than 1mm and are clear and buoyant.

They soon hatch into prolarvae at about 15 to 16 hours after spawn. They are like tiny slivers of glass and are basically eggs with tails.

At around 2 days, they start to develop their mouths and eyes, and by day 3, you can see they are well developed.

By day 4, they are much more active and are swimming around. You can start to see the eyes more clearly, even though they are still no bigger than a couple of millimeters.

After many rearing attempts, I would say that Lyretail Anthias prolarvae can only survive 4 or 5 days unless they are provided with a suitable food source. I think the quality of eggs may have differed between females, with the bigger fish releasing eggs that produced hardier prolarvae. Prolarvae from the larger fish could last until day 5 on a better egg yolk. Prolarvae from the smaller, perhaps younger fish perished sooner.

I kept the eggs and prolarvae in a round tank that acted like a kreisel, keeping the prolarvae in suspension. On day 4, I added the only food I had access to: S-strain rotifers (*Brachionus rotundiformis*). There was also a strong culture of ciliates that had contaminated the rotifer culture, which I thought would add to the available foods. The rotifers were fed Rotigrow Plus and the kreisel water was tinted with Rotigreen Omega. The longest I was able to keep any prolarvae alive was 10 days.

Interestingly, it was the addition of more ciliates into the tank that I think kept them going to day 10. Certainly, the S rotifers were too big, but being in the UK has its limitations as far as access to live foods.

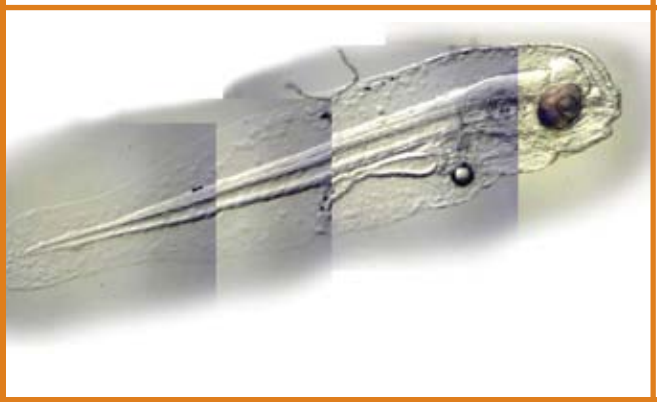
So why did I fail? I think the size and quality of the food I had to offer was poor. I couldn't be sure what, if anything, they were eating for the first 6 days. I believe that the adult rotifers were too big, so that leaves ciliates (of some unknown species and nutritional value) and young rotifers that were no doubt hatched in the kreisel and

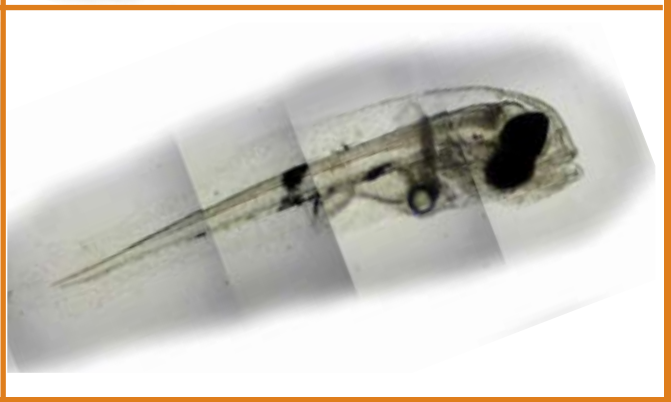
DAY 3 POST SPAWN

DAY 4 POST SPAWN

TOP VIEW

SIDE VIEW





This tank kept the prolarvae in suspension but lacked any filtration.

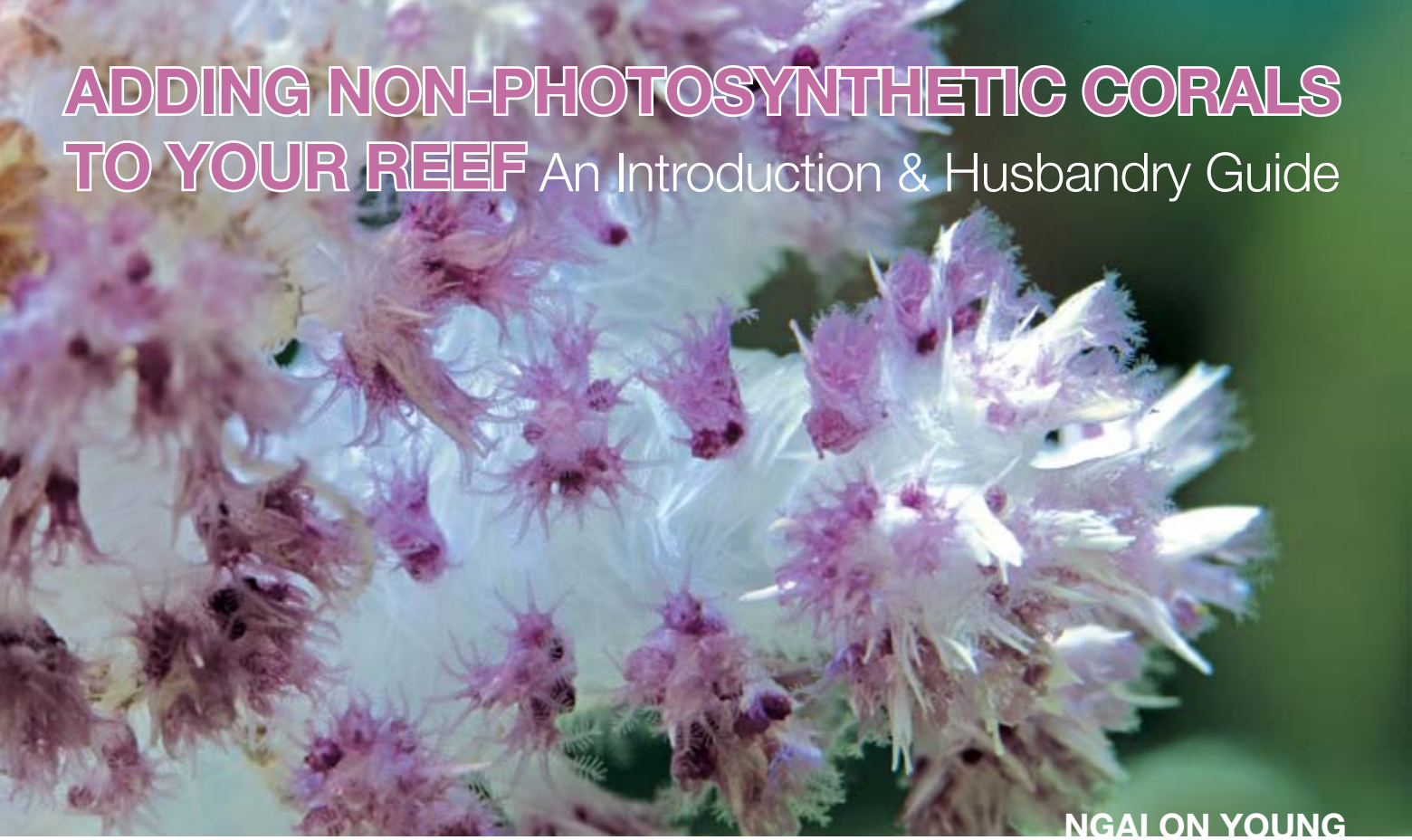
as such were low in nutritional value. I don't believe we'll see much success with pelagic spawners in the UK unless we are able to offer their larvae smaller, more nutritious live foods.

I also have to say that the water quality in the kreisel, after 6 days of accumulated dead phytoplankton, rotifers, and larvae, was no doubt poor. This eventually would have resulted in large ammonia spikes and a likely subsequent loss of the larvae. Because they were so small, any shift in water quality would have been detrimental to them.

PLANS FOR THE FUTURE

Unfortunately, I lost my trio to what I think was an over population of bristle worms – all three died overnight, and the various holes they slept in were teeming with bristle worms the next morning. However, I won't give up on anthias. I am in the process of trying to source *Colurella adriatica* and *Apocyclops panamensis*, two smaller and more nutritional food sources. I am also re-designing the kreisel to include some filtration in the tank itself to cope with the ammonia spikes and their impact on water quality. It's been very humbling to fail so often with fish I love, and I have sometimes questioned why I continue to try. The simple answer is that I love these fish, and there's rarely success without a lot of failure. This is the reality for most fish breeders working on new species and is especially true for those of us attempting to breed the reef fish we cherish.

ADDING NON-PHOTOSYNTHETIC CORALS TO YOUR REEF An Introduction & Husbandry Guide



NGAI ON YOUNG

Non-photosynthetic (NPS) corals are corals that do not contain zooxanthellae algae and therefore do not receive any sustenance from light. These range from the popular sun corals to gorgonians and other soft NPS corals. In contrast to the subtle coloration of SPS (small polyp stony) corals, NPS corals often have bold colors. They add movement to an aquarium and are often the first corals to catch the attention of casual observers.

NPS CORALS AND BASIC CARE REQUIREMENTS

- *Tubastraea* spp. (Orange Sun Corals, Yellow Sun Corals, Black Sun Corals)

The popular *Tubastraea* are large polyp stony corals which are often round-bodied with radial polyps encased in tubes and surrounded by colorful feeding tentacles. They can be bright pastel-yellow, orange, reddish-yellow, pink, or in the case of the branching *Tubastraea micranthus*, black or greenish-black.

There are six recognized species of *Tubastraea*:

-*T. coccinea*
-*T. faulkneri*
-*T. micranthus*
-*T. diaphana*
-*T. floreana*
-*T. tagusensis*

Many species such as *Tubastraea aurea* or *Cladopsammia gracilis* have been synonymised with *Tubastraea coccinea*. They are fairly common and can be found in both shallow and deep water, often growing upside down in caves and under ledges where the water is rich in nutrients. There are two growth forms of *Tubastraea*: bushy (plocoid) or branching (dendroid). *Coccinea* is the most commonly imported bushy species. The branching varieties have more of a tree-like appearance (dendroid) in that their polyps have a tubular skeleton and new polyps branch out from the tubes (vs. the base) of existing polyps.

Sun corals are what I would term 'meaty feeders' and will feed on large meaty items like brine shrimp, *Mysis* shrimp, bloodworms, or even chopped seafood. They should be fed at least every other day to maintain growth and healthy tissue. Like most animals, it is best to give them a variety of foods in their diet. Smaller foods such as Cyclop-eeze will trigger a feeding response, but these corals are not particularly adept at gathering large amounts of smaller foods. Each of the polyps in a colony is independent of one another and has to be fed individually. This is true even of the bushy variety where there is connective tissue between each polyp and the entire colony appears to be one big mat.

***Tubastraea coccinea* showing the arrangement of polyps attached to a common base.**

***Tubastraea micranthus* (Black Sun Coral). Note the branching, tree-like structure.**

These corals tend to be nocturnal, and the polyps will typically stay closed during the day. However, after they acclimate to captivity, they will often open up during the day if they detect food in the water column.

Even though sun corals come in various distinct colors, I have found that their colors can change. Different color colonies may end up becoming the same color, and in some cases, a single colony may exhibit polyps of different colors.

Tubastraea are not picky about water conditions. They do, however, require medium to strong flow to encourage their polyps to open. One common belief is that these corals are adversely affected by strong lighting. I have not found any evidence of this, but take note that intense lighting plus high nutrient levels will result in algae growth which can be a problem.

- *Dendrophyllia* spp. (Dendros, Sun Corals, Orange Cup Corals)

There are 31 species in this genus, many of which are not commonly available in the hobby. There are red, orange, yellow, and even white varieties. *Dendrophyllia arbuscula* is probably the most common species sold in North America. Dendros are generally branching corals with polyps growing out from the tubes of other branches. The tentacles are longer and more translucent in appearance than *Tubastraea*. When the polyps are closed, it can be hard to tell them apart from branching *Tubastraea*, but a healthy dendro will generally have orange tissue growth along the length of the tube, whereas most branching *Tubastraea* (except *micranthus*) will have

A close-up of *Dendrophyllia arbuscula* showing the nematocysts on its tentacles and the orange tissue surrounding the mouth.

a pale coloration along the outer wall of the polyp. Keep in mind this is just a generalization based on commonly traded species.

Dendros have the same care requirements as *Tubastraea* with the one main difference being that dendros will stay open during the day without any coaxing. At night, however, the polyps will expand even more fully. It is for this reason that they are more sought after and often more expensive than *Tubastraea*.

- *Rhizotrochus typus* (Rhizo Coral)

These highly desirable corals are rarely seen in local fish stores. This is due to CITES restrictions on the import (and collection) of these corals from specific countries, but these regulations do not restrict owning or selling a legally collected specimen. Rhizos are

Rhizotrochus typus showing its singular polyp structure with tentacles extended.

single-polyp corals that have an oval shell commonly 3 to 5 inches wide with a deep skeleton up to 4 inches in depth. They come in a variety of brilliant colors such as red, orange, and white. There is also a red and white tiger-striped variety that is fairly common. The oval shells have walls that separate the individual tentacles. The tentacles can extend out as much as 4 to 5 inches and often have fluorescent tips. The movement of these corals is simply alluring. During the day, they will show some polyp extension, but they will only open fully at night.

Rhizos have the same care requirements as sun corals but because of their size can take larger food items. They should be fed daily to encourage growth.

Diodogorgia nodulifera (Red Finger Gorgonian).

- Non-Photosynthetic Gorgonians

The elegant gorgonian corals resemble small trees in a reef aquarium. They derive their name from gorgonin, the hard protein substance that makes up their rigid structure. They come in a variety of bright colors, and their gentle swaying motion will instantly add to the visual appeal of any reef environment. The non-photosynthetic varieties are often considered difficult corals to maintain, with the challenge being to provide enough nutrients for their good health. They need to feed multiple times a day to prevent tissue loss and encourage robust growth.

A good starter non-photosynthetic species is *Diodogorgia nodulifera*. There are two popular color variants of this coral: the Red Finger Gorgonian, which has bright red branches and large, white, flower-like polyps, and the Yellow Finger (or Tigerskin) Gorgonian, which is bright yellow with large, white polyps. These are predatory corals, and the white polyps will react aggressively to food in the water column. When the nematocysts of the coral (cells on the small tentacles) detect food, the polyps will begin to exhibit a grasping motion which captures food and moves it to the mouth at the center of the polyp. Because of the larger size of the polyps, this feeding response is easily observed, allowing you to determine which foods are preferred by this particular species. I have found that these corals show the strongest feeding response to larger foods like Cyclop-eeze (especially the frozen variety), brine nauplii, and de-shelled brine eggs. This is followed by the prepared coral foods such as Reef-Roids, Coral Frenzy, and others. I find that they show no feeding response at all to phytoplankton.

Strong water flow is essential to ensure that gorgonian corals remain algae and cyanobacteria free. A lack of water movement will mean certain demise for these animals as algae will cover their branches; this will very quickly lead to tissue recession. Good water quality is desirable in the sense that it will minimize algae and cyano growth.

- Chili Corals (*Nephthyigorgia* spp., *Alcyonium* spp.)

These exotic corals form finger-shaped branches, and their polyp colors often stand out in striking contrast to their deep red body color. During the day, chili corals often shrivel up with all the polyps fully retracted and barely visible. In this state, they are vulnerable

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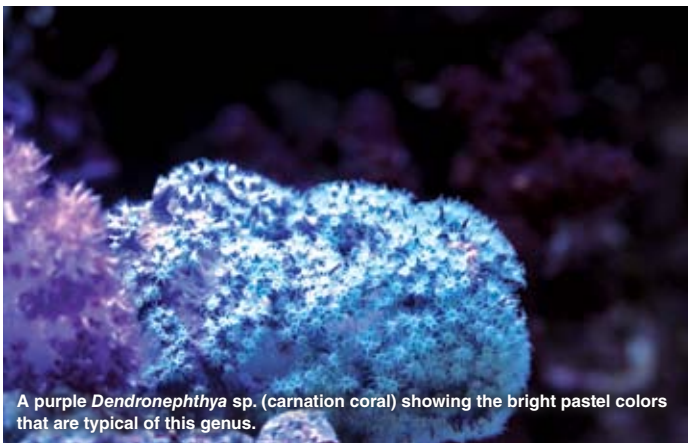
to algae overgrowth and the accumulation of detritus. They require moderate to strong flow to encourage polyp extension and to prevent algae growth over their tissue. These corals should be fed daily, preferably several times a day. Rotifers, Cyclop-eeze, and packaged coral foods are all readily accepted in my experience, but the right mix of foods is often species dependent. The polyps will show a definite feeding response and grasp at suitable foods. Like most soft non-photosynthetic corals, chili corals are not picky with respect to water quality.

There are conflicting reports about whether chili corals are adversely affected by light. In my experience, I really have not found that they need to be protected from light. In fact, my chili coral (*Alcyonium* sp.) opens up several times a day in a brightly lit system.

- Carnation Corals (*Dendronephthya* spp., *Scleronephthya* spp.)

These corals possess some of the most exquisite colors displayed in the reef environment. Carnation corals come in a large variety of colors and resemble leather corals in terms of general shape. Sadly, they do not have a great track record for durability in aquariums and often perish within a year. Like the chili coral, they will inflate and deflate over the course of the day. Carnation corals require moderate water flow and need to be fed multiple times each day. They will readily accept smaller foods such as rotifers, Cyclop-eeze, brine nauplii, and coral foods. In some species, the polyps can be quite small, so you will have to watch closely to observe which foods elicit a strong feeding response.

A close-up of a lavender carnation coral.



A purple *Dendronephthya* sp. (carnation coral) showing the bright pastel colors that are typical of this genus.

***Nephthyigorgia* sp. (chili coral). With striking yellow polyps on a bright red base, these are eye-catching specimens.**

ACQUISITION, QUARANTINE, AND PLACEMENT OF MEATY FEEDERS

In terms of choosing the healthiest colony of sun corals, the most obvious indicator is tissue health. Stay away from specimens that have substantial tissue recession between polyps. These corals may be in rapid decline. For the bushy growth forms (*coccinea*, *fistula*), try to get specimens that have connective tissue throughout all the polyps in the colony. Any dead polyps or polyps showing the calcium carbonate skeleton are a bad sign. For branching forms (including *micranthus* and dendros), look for specimens that have good tissue growth all along the tubes of the corallites. Avoid specimens that seem to be covered (even partially) in algae or cyanobacteria as there are some parasitic species that actually feed on the coral itself. Also, avoid specimens where the outer layer of tissue appears to be coming loose from the coral skeleton.

There are parasites which are specific to *Tubastraea* and *Dendrophyllia*, and one example is the *Phestilla melanobrachia* nudibranch. Adults can grow to 40mm in length. They are red, yellow, orange, brown, or black in color and can make short work of a colony. CoralRX is known to be effective on the adults but not the eggs. As a preventive measure, you should make a careful visual inspection (especially of any associated rock or mounting) and remove any spiral egg masses on new specimens.

In terms of the placement of meaty feeder corals, the most important consideration is to position them so that you will be able to feed all the polyps easily. *Tubastraea* and dendros are peaceful corals, and despite having good food-capturing ability with their nematocysts, they are surprisingly the losers if they come into contact with other corals. I once had a SPS frag fall onto a sun coral colony, and when I noticed it a couple of hours later, the frag had taken out five sun coral polyps.

I have found that the best method for feeding these corals is to target feed them with a syringe-type tool (e.g. Julian's Thing) or a

A fat head dendro (*Eguchipsammia fistula*) showing healthy tissue and full polyp extension.

This polyp is open and ready to feed.

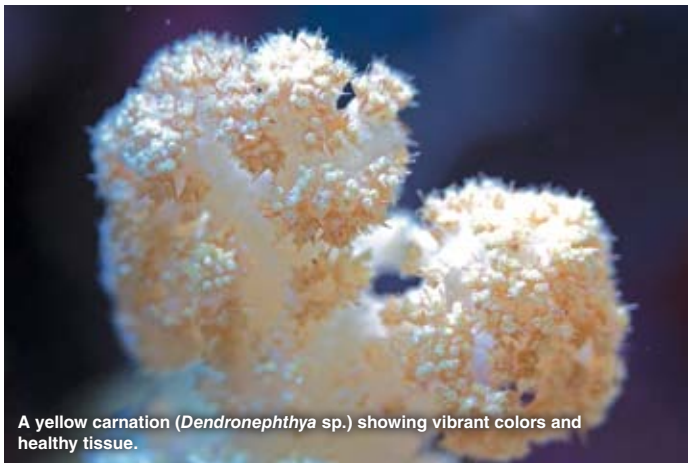
small turkey baster. Feeding consists of squirting a small amount of food into each polyp, which will respond by grasping at the food. While this may seem tedious, I have over 10 colonies of sun corals in my tank and get through this routine in less than 10 minutes. New acquisitions should be fed daily for at least a month to restore tissue health.

One dilemma in feeding sun corals is that all the other livestock in the tank are attracted to the sun coral's food and will try to steal it before it's fully ingested. Shrimps in particular will aggressively pull food right out of the polyps. I have a large Orange Shoulder Tang who seems to think the food in the polyps is some kind of smorgasbord and goes from polyp to polyp pulling all the food out. One way to deal with this is to put a plastic container (such as a 2 liter plastic bottle cut in half) over the coral after it has been fed to shield it from other livestock. I generally feed after the main lights go out and the fish seem to lose interest.

BUYING GORGONIANS

Look carefully at all the branches and avoid specimens that have dead tissue on them. This is a sign that the coral is already in decline. If there is algae or cyano on them, ask the LFS employee to blast water on it to make sure it comes off and there is no dead tissue underneath. Other than algae and cyano, gorgonians do not have a lot of parasites. There is a species of bristle worm that will eat gorgonians, but it is not common.

Check over the rock that the gorgonian is attached to for hitchhikers. I recommend dipping the rock that is attached to the gorgonian



A yellow carnation (*Dendronephthya* sp.) showing vibrant colors and healthy tissue.

Although you probably won't see polyp extension like this at the LFS, a healthy chili coral should be free of any tissue necrosis.

in freshwater for 1 minute, making sure to keep the gorgonian wet with saltwater at all times. I actually don't dip the gorgonians themselves, but if you choose to, use an iodine-based dip at about half strength and dip for no more than 3 to 4 minutes.

BUYING SOFT NPS CORALS

Avoid getting specimens that seem to be disintegrating where the flesh of the coral appears unhealthy or discolored. If at all possible, try to buy specimens that came in on a recent shipment as opposed to a specimen that has been sitting in a LFS for weeks. Keep in mind that just because the coral appears flopped over does not necessarily mean it is unhealthy – some just do that, especially during the day.

New acquisitions should be dipped like any other soft coral. They have a preference to being hung upside down, but that is not absolutely critical.

MAXIMIZING FOOD INTAKE

Feeding time for NPS corals is a messy affair. At the end of a feeding session, there is usually a substantial amount of food floating in the water column as the corals will only capture a fraction of what is directed at them. This is especially true for gorgonians and soft NPS corals. With an efficient filtration system, this food will either get caught in filter socks or skimmed out. To maximize the intake of food by the corals, I employ a two-stage approach. The first stage is simply target feeding as one normally would. In the second stage, the return pumps and skimmer are turned off for 45 minutes, and the overall flow within the tank is reduced by 30% (I do this by turning specific powerheads off). During this time, I use a smaller auxiliary powerhead that is pointed directly at specific corals (gorgonians in my case) to ensure there is a direct flow to the target corals. I let this run for 45 minutes as I find most of the food seems to have settled out of the water column by then. Obviously, this is a lot more easily accomplished if you have a controller.

LIGHTING FOR NPS CORALS

From a lighting perspective, the most important consideration is really one of aesthetics. Unlike SPS corals, NPS corals do not require actinic lighting to bring out their colors. Most NPS corals are brightly colored even under regular room lighting. A simple 10,000K setup (or even 6,700K) is sufficient. Since a lot of NPS corals have red or yellow/orange coloration, lighting with some reds (Fiji Purple) and yellows (Coral Plus) in the spectrum will help bring out these colors. In fact, I find heavy actinic lighting tends to visually dull out the natural colors of NPS corals.

MY CURRENT NPS ENVIRONMENT

My system is a 110 gallon display tank with a 30 gallon sump. The NPS corals I keep are *Tubastraea coccinea* (6 colonies), *Tubastraea micranthus* (4), *Tubastraea* sp. (branching, likely *diaphana* or *faulkneri*), *Rhizotrochus typus* (2), *Dendrophyllia arbuscula*, *Eguchipsammia fistula*, *Diodogorgia nodulifera* (yellow and red), *Alcyonium* sp. (chili coral), and *Dendronephthya* sp. (2). This is in

A healthy branching sun coral with signs of new growth emerging from the coralites.

addition to a mix of LPS and SPS corals and a gang of always-hungry tangs. I run a CSC 250 skimmer in the sump that is rated for 250 gallons along with a GFO reactor and a carbon reactor. As for water flow, I have a Jebao WP40, a Sicce Voyager 3 (1200 gph), and a Hydor Koralia (550 gph). I run a refugium with over 20 mangrove plants, chaeto, and grape *Caulerpa*.

PARAMETERS

Specific gravity: 1.025
Temperature: 77F (79F in the summer)
pH: 8.0
Nitrates: 10-20ppm
Phosphates: 0.05ppm
Calcium: 460ppm
dKH: 10
Magnesium: 1300ppm

I do weekly water changes of 30 gallons and dose using a 2-part system plus magnesium. I also add kalkwasser using a homemade stirrer/pump system controlled through an Apex controller. Lighting consists of a 6x54W T5 system (Coral Plus, white and blue actinic, Fiji Purple) supplemented by three Kessil A150W's.

MY FEEDING SCHEDULE

Morning (before work): seaweed on a clip for tangs, target feed gorgonians and soft NPS

Afternoon: pellets for fish (done by my family – because the fish look hungry and need a snack, apparently), target feed gorgonians (the soft corals are not usually open at this time)

Evening: pellets for fish, target feed gorgonians and soft corals

After main lights out: target feed meaty feeders; sun corals and dendros get fed every other day, Rhizos and *fistula* get fed every day

I feed my NPS corals the following: meaty feeders receive a rotating regimen of blood worms, *Mysis*, brine shrimp, marine plankton, and chopped seafood (for the Rhizos); gorgonians and soft NPS receive a mix of frozen Cyclop-eeze, dried Cyclop-eeze, brine eggs, oyster eggs, rotifers, Reef-Roids, and Coral Frenzy (not all at once and usually along with some frozen and dried foods).

SUGGESTIONS AND RECOMMENDATIONS

The most important consideration before adding a NPS coral is to make sure you are willing to spend the time required to feed it. With a regular feeding routine, these corals are relatively easy to maintain. NPS corals do require an investment of time, but in return, they will add substantially to the beauty and diversity of your reef environment.

Enticing Sun Corals to Open After Acquisition

One of the challenges with newly acquired sun corals is that they sometimes won't open after you put them into your tank. This is likely due to the fact that they haven't been fed in weeks and are conserving energy by not expanding. To get the polyps to open, try the following:

1: Arrange your powerheads so that the coral receives direct flow. The flow and any dissolved food in the water column may trigger the polyps to open.

2: Prepare a small quantity of 'prompter' food. The best prompter foods are those that have a strong smell to them. I use a mix of an angelfish food (with chopped clams and fish), frozen ocean plankton, *Mysis*, and dried Cyclop-eeze. Turn off the flow in the tank and squirt this food directly at the polyps and wait about 10 minutes before turning the flow on again.

3: If neither of the above works, prepare a small plastic container that is larger than the coral. Fill the container with tank water and put the coral inside. Squirt prompter food at the coral until you have a visible concentration of food in the container. Manually move the water around in the container so there is a flow. The sun coral should sense the presence of food and open up. Feed the polyps right away. Then replace the coral (but not the water) in the tank.

You may have to repeat steps 1 and 2 a few times before a new coral opens up. I had a stubborn *micranthus* colony that took 3 weeks before it finally decided to open up and feed.

One of the cornerstones of re

eef keeping is proper nutrition.

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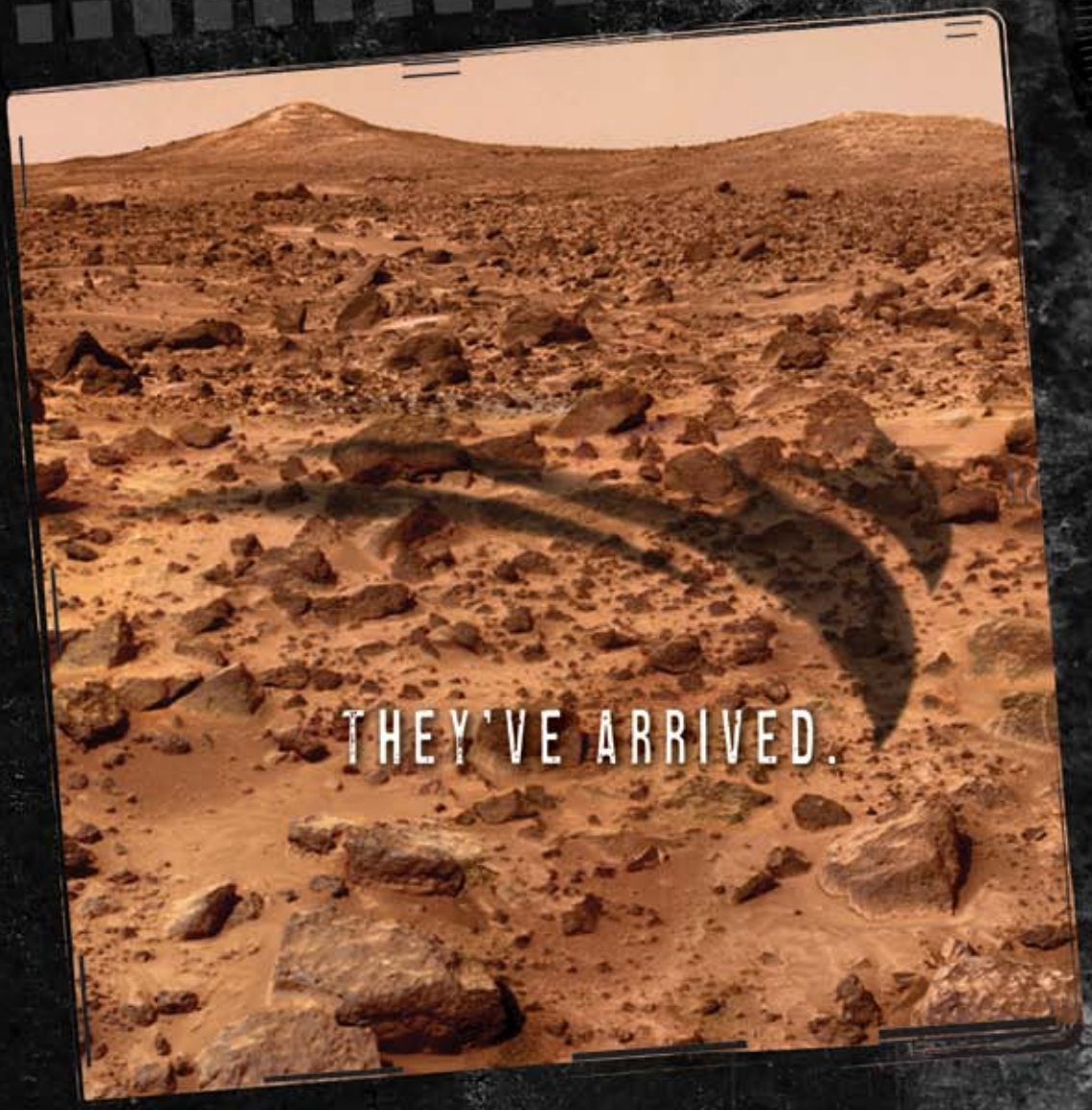

EPISODE 2 >