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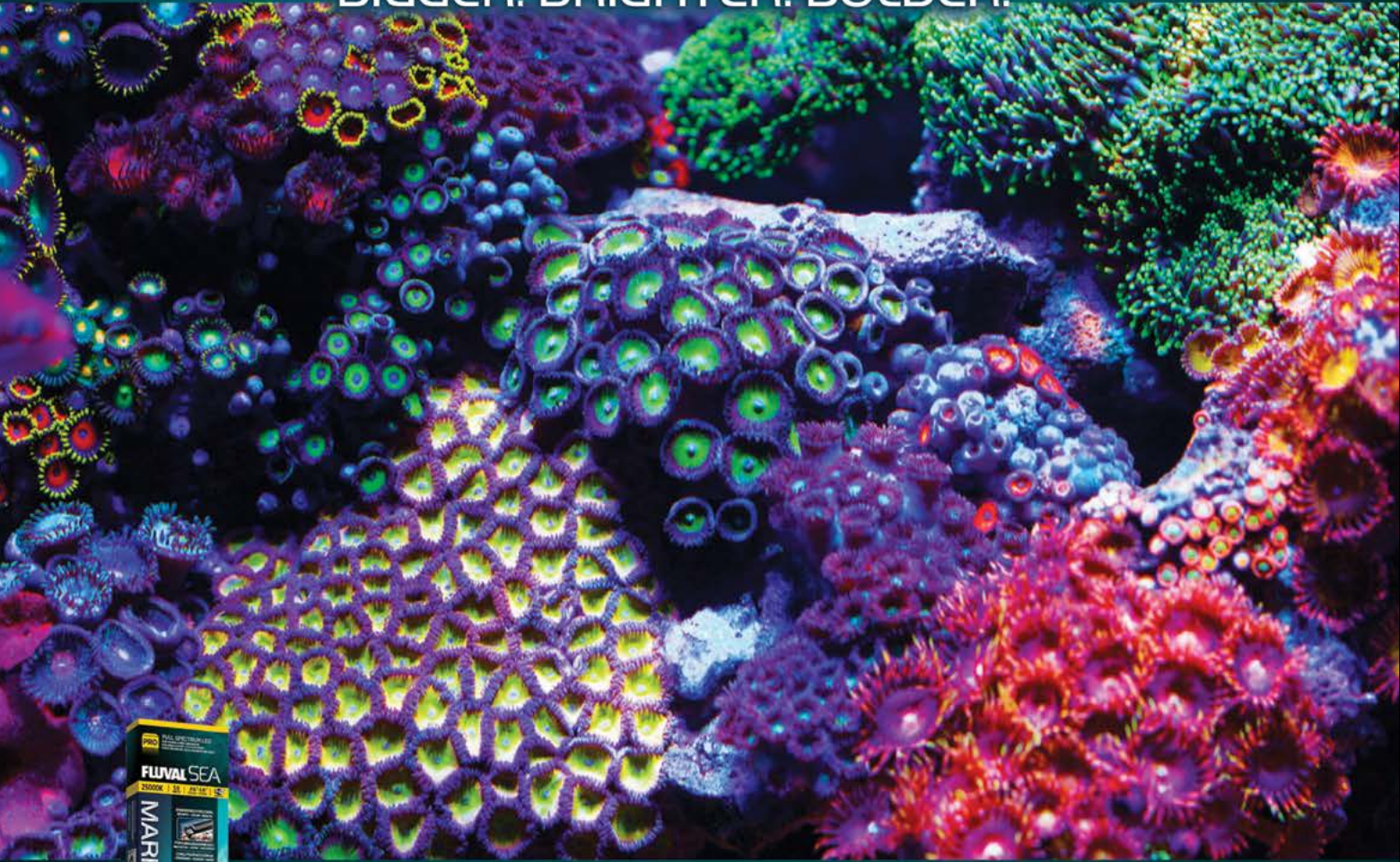
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6 13 MACROALGAE FOR YOUR REEF

Kelly DeLaVergne is a veteran hobbyist from Indiana and a strong advocate for women reefers. In this detailed review, Kelly describes her 13 favorite macroalgae and the specific lighting and chemistry they need to thrive.



10 ZEBROSOMA TANGS

Richard Aspinall is a freelance writer and photographer living in Yorkshire, England, specializing in travel, wildlife, and scuba-diving subjects. For anyone planning to keep *Zebrosoma* tangs, this article contains all the critical information necessary for you to succeed.



18 STRATEGIC FRAGGING: PLANNING FOR SUCCESS

Adam Mullins is a professional aquarist and co-owner of The Mystic Reef in Riverside, California. The time has come to prune your corals. Have you made a plan to include the health, aesthetics, and future growth of both the parent colony and the frag? If not, be sure to consult this article first.



26 ASTRONAUT FOOD FOR YOUR REEF

Jason Oneppo has more than 25 years of experience in the aquarium industry and has been doing R&D for San Francisco Bay Brand for over a decade. Jason relays the history, broad uses, and best picks among the wide array of freeze-dried reef foods available today.

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INSIDE A PREDATOR'S REEF

Felicia Svedlund is a recent PhD graduate and has been a lifelong aquarium hobbyist. Willing to brave the unconventional, Felicia has constructed an amazing reef tank based on housing predatory lionfish. Whether or not you ever plan to keep a predator reef, this display will inspire you to think outside the box.

Cover image by Felicia Svedlund



44 ONE BAD PECTINIA

Mindy Van Leur has been a reef keeper for over 20 years with an affinity for *Acropora* corals and helping new hobbyists. The Tyree Space Invaders *Pectinia* is one of Mindy's favorite corals. See how she maintains this coral's unearthly color and shape in her reef.



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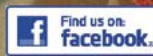
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KELLY DELAVERGNE

13 macroalgae for your reef

I began using Chaeto (*Chaetomorpha*) as a means of nutrient export many years ago in a refugium under my reef tank. When I decided to start raising seahorses, whose tanks have much higher nutrient levels due to constant feeding, I knew the macros would be crucial in helping me keep the tank clean. I had no idea I would end up loving the algae almost as much as the seahorses.

If you are looking for nutrient export only, I would suggest *Caulerpa*, *Chaetomorpha*, or *Gracilaria parvispora*, which are all fast growing, high nutrient uptake macros. However, of the three, *Caulerpa* is my least favorite. It has a tendency to spawn, or go “sexual.” If *Caulerpa* does not get enough light, is not pruned regularly, and/or isn’t happy for whatever reason, it will start to become pale. If you see this, make sure to remove it immediately. It means the alga fears death and is about to release its spores into the water column, along with all other nutrients stored in the living alga. This not only clouds the tank, but it affects oxygen levels and can literally kill off entire systems. Of all the macros I’ve encountered, only *Caulerpa* has given me this problem. One way to combat this issue is to attach a second macro tank that is set up on a reverse light cycle. My personal tank is attached to a sump with an algae scrubber. The tank and scrubber each get 12 hours of light on alternate schedules.

PREFERRED TANK PARAMETERS FOR MACROALGAE:

Temperature: mid 70s F

Specific Gravity: 1.024–1.026

Calcium: 400–450 ppm (many macros are calcareous and require as much calcium as corals)

Magnesium: 1,100–1,300 ppm

Nitrate: 5–10 ppm (in an actual macro display, you may have to dose nitrate to keep up with the needs of the algae...or just keep seahorses!)

Phosphate: .5–1.0 ppm (same as nitrate; the algae need phosphate to survive. If you’re having trouble, your tank might be too clean)

Lighting: depends on the species, but generally 2–3 watts per gallon of 6,500–8,000 K lighting will make most macros happy. I currently use a Fluval 24/7 plant light but will be adding an SB Reef light for a better spectrum.

I do weekly water changes, dose Seachem Reef Plus, and add Brightwell iron, magnesium, and iodine as needed based on monthly testing results.

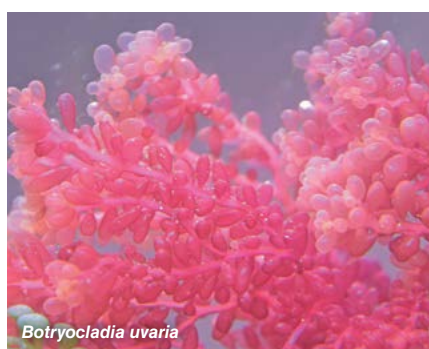
RHODOPHYTA—RED ALGAE



Gracilaria parvispora is a pink-branched alga that looks almost like a Birdsnest Coral. This alga could replace Chaeto in a refugium since it grows ridiculously fast. It will do well in any lighting and any flow, but it becomes pinker in stronger light and grows much faster in stronger flow. Stronger flow also helps to

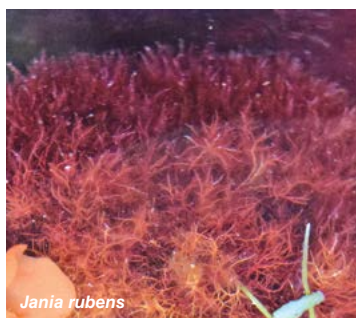
stop cyano and hair algae from getting caught and growing in its branches.

Faucea is an alga that looks like shimmering pink petals. This alga prefers moderate light and flow. I've personally found that it maintains the deep pinkish-purple color better in lower light. It needs enough flow to stop particles from building up between the branches but not enough to tear it.

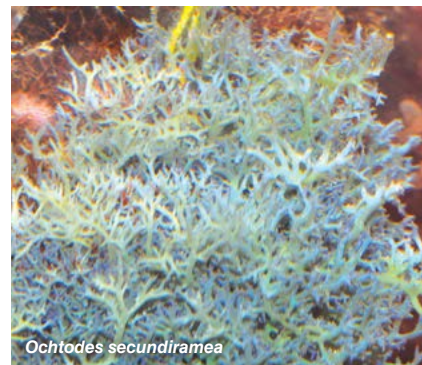


Botryocladia uvaria looks like red bubbles. This alga will grow in any light but keeps a deeper red color in lower light. It also grows in any flow but will grow faster, with less chance of nuisance algae getting caught in between the bubbles, in stronger flow.

Jania rubens has lightly calcified cylindrical branches that form a sort of mat. This alga is usually found in shallow waters. Therefore, it will do better in your tank under stronger light but will survive in almost any lighting. While it doesn't require strong flow, this tends to keep it looking cleaner.



Blue *Ochtodes* (*Ochtodes secundiramea*) adds brilliant blue color to any macro display. Falling into the Rhodophyta category, *Ochtodes* will also be a deeper color in lower light. Unfortunately, herbivores will eat *Ochtodes*, and this alga can become invasive since it covers rocks. In my personal tank, with other macros competing for nutrients, *Ochtodes* has grown only where I have placed it.



Halymenia durvillaei is known as Flame Algae or Dragon's Breath. This alga will grow in almost any condition. I've even found it growing in a completely dark cave with very little flow. However, *H. durvillaei* will have the best coloration in moderate to strong light and flow.

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Halymenia floridana

Rose (*Halymenia floridana*) is an alga that is also referred to as red sea lettuce. This silky smooth macro grows into curling waves, resembling a rose. It will grow in almost any lighting and flow but will turn deep

red in lower light and almost orange (like mine) in stronger light. The light spectrum also plays a part, because strong lighting with a reef light (more blue) will help maintain the deep red color. I personally like it orange. Herbivores will eat this macro, unfortunately.

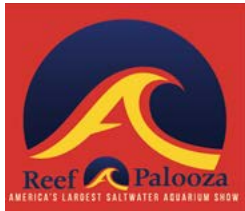
CHLOROPHYTA—GREEN ALGAE

Neomeris annulata

is a calcareous turf alga that prefers strong lighting and moderate flow. Calcium must be monitored, and it can become invasive if not pruned regularly. However, its unique appearance and bright



Neomeris annulata



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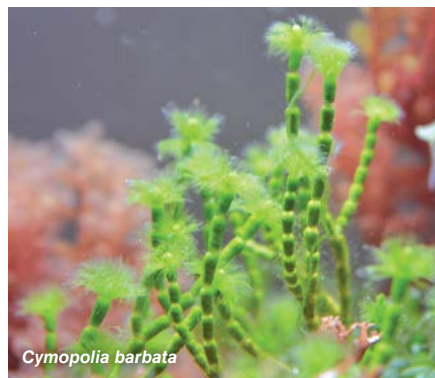
color make it one of my favorites. Herbivores won't eat it, but I've seen snails nibble on it at times.

Codium sp. is a green alga known as Dead Man's Fingers. Most sites recommend attaching this alga's single holdfast to rock. I personally have some attached to rock but also have some just floating at the top of the water. It will grow in tighter clusters in lower light



Codium sp.

but have wider branches in stronger light. Herbivores don't typically eat this alga, and it does not grow fast enough to become invasive. *Codium* has grown well for me in many different types of lighting and flow, but I've noticed it seems fluffier in stronger flow.



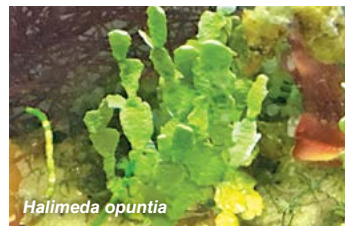
Cymopolia barbata

Cymopolia barbata

, or Tufted Joint Algae, has bright green stems, bursting with little tufts of light green fluff at each end. This alga makes a unique and pretty addition to any macro tank. Growth occurs with each stem splitting into numerous new

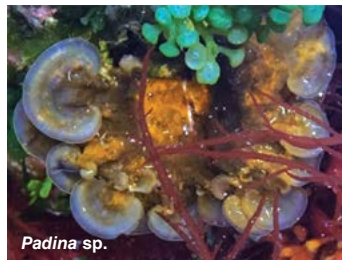
stems and buds growing from the stem itself. It does not extend roots and will not take over a tank. *Cymopolia* will grow faster in stronger light and is calcareous, so calcium levels must be maintained. Tangs and angels will not likely eat this alga.

Halimeda opuntia grows as segmented, calcified disks from a single holdfast instead of runners and is one of the least likely algae to become invasive and take over a tank. Herbivores won't eat the calcareous blades.



Halimeda opuntia

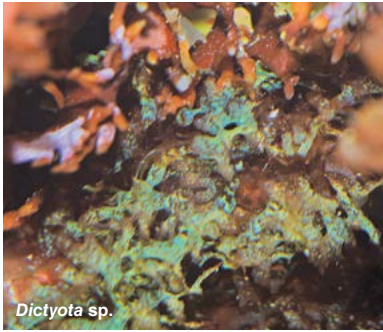
PHAEOPHYTA—BROWN ALGAE



Padina sp.


Padina (Padina spp.), also known as blue scroll, are some of the best nutrient exporters in the brown-algae category. These beautiful macro species attach to live rock and begin to show iridescent blue coloration and scroll into overlapping layers if

kept in proper conditions. I recently added some blue scroll to my tank, and I've quickly realized it needs full spectrum lighting with lots of actinic. It grows well in my tank, but it will gain more of the blue color after I add more of the lighting it prefers. These algae will do best near the substrate in medium light and flow.



Blue Dictyota (*Dictyota* spp.) are species of algae considered by many to be invasive. I personally love these algae. The species I keep appears red underneath with iridescent blue, Y-shaped leaves. Probably not the best macroalgae alone in a tank, but with other

algae competing, it has only grown where I wanted it to for over a year. These algae prefer low light and low flow.

Macroalgae are the natural solution to nutrient removal. Not only are they effective in removing nitrate and phosphate from the system, but they also out-compete nuisance algae. Macroalgae provide a perfect place to grow a population of copepods and amphipods, and they also use up carbon dioxide and give off oxygen through photosynthesis, which provides numerous benefits to the tank and its inhabitants, including stabilizing pH. Most importantly, macroalgae are beautiful. 



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ZEBRASOMA TANGS



A collection of *Zebbrasoma flavescens* in a very large tank is a beautiful sight.

Images by author except as noted
RICHARD ASPINALL

Of all the genera of fish that are kept in aquaria, there are few that are as immediately recognizable and as continuously popular as the genus *Zebbrasoma*. From the commonly kept and much-loved Yellow Tang (*Zebbrasoma flavescens*) to the rare and prized Gem Tang (*Z. gemmatum*), aquarists keep returning to this great group of fish for both aquarium staples and expensive rarities.

A quick look through any fish-keeping book or a search online with a resource such as Fishbase.org will show that there are only seven species in the *Zebbrasoma* genus. The genus itself is part of the family Acanthuridae, which is composed of surgeon fishes, tangs, and unicorn fishes. I should add that *Zebbrasoma* refers to zebra, the African horse, and soma, Greek for body. This references the stripes seen on some species.

<i>Zebbrasoma desjardinii</i>	Indian Ocean Sailfin Tang	Indian Ocean
<i>Zebbrasoma flavescens</i>	Yellow Tang	Pacific Islands
<i>Zebbrasoma gemmatum</i>	Spotted or Gem Tang	Western Indian Ocean
<i>Zebbrasoma rostratum</i>	Longnose or Black Tang	Eastern Central Pacific
<i>Zebbrasoma scopas</i>	Scopas Tang	Indo-Pacific
<i>Zebbrasoma velifer/veliferum</i>	Sailfin Tang	Western Indian Ocean
<i>Zebbrasoma xanthurum</i>	Purple or Yellowtail Tang	Red Sea, North Western Indian Ocean

So where do they all come from? Well, these fishes are mainly from the Indo-Pacific and Pacific regions, but as you can see, they are very well distributed. You'll note there are no records of the genus from the Atlantic, apart from some reports of Yellow Tangs being found off the coast of Florida, after presumably being released from aquaria.

A quick look at any pictures of *Zebbrasoma* fishes will show that they all have the same basic body shape; they are all laterally compressed and, with some variation, have elongated facial structures that allow them to graze algae from and between a wide range of surfaces. These fishes also possess acanthi (plural for acanthus), the partially retractable spine on the caudal peduncle that gives the Acanthuridae their common name of surgeon fish. These fish can be aggressive and will defend their aquarium territory against similar-sized and similar-shaped fish and of course other members of the *Zebbrasoma* genus. I'll get to their aquarium care shortly, but first let's meet the species.

Zebbrasoma desjardinii

Zebbrasoma desjardinii hails from the Indian Ocean and is often called the Indian Ocean Sailfin Tang, or even Desjardin's Tang after the French zoologist, Julien Desjardin. The fish is locally common across the region and is found from the shallows to below 30 meters, occasionally in groups but more commonly in pairs or alone, where it spends much of its time grazing on filamentous algae.



Young Sailfins are very attractive, and both species have a bright yellow hue. I am unsure which species this juvenile is.



A large and robust *Z. desjardini* in an aquarium. This fish shared a 1200-liter aquarium and experienced superb water quality.



A healthy, young *Z. flavescens*.

Z. desjardini can reach quite a large size (around 40 centimeters), which makes it unsuitable for many home aquaria. Personally, I'd not want to see one of these fish in any tank under 700 liters (~185 gallons). This species is often sold as small juveniles that are much yellower in coloration than the adults and are quite attractive to potential purchasers who might not know how large they will grow and how they can dominate other tankmates. Beyond that, they are relatively easy to keep and of all the large tangs are quite good fish to seek out, being less boisterous and troublesome than some of their similar-sized cousins from other genera.

Zebrasoma velifer

Zebrasoma velifer has the broadest natural range of all the species in this genus. It is found in the Western Indian Ocean and from Indonesia to the Great Barrier Reef. There is some crossover between *Z. velifer* and its cousin, *Z. desjardini*, which replaces it in the Eastern and Central Indian Ocean.

Both species share similar ecology, size, and care requirements, but how can we tell them apart? This isn't always easy, especially as the fish may change coloration depending on mood. Indeed, it might be best to source your fish from a dealer who can guarantee the origin of the fish. You can, of course, try for a positive ID by counting anal fin rays; *desjardini* has 22–24 as opposed to the *velifer*'s 23–36, but few of us are ever going to do that. I have to say I find these juvenile fish impossible to tell apart. Some sources suggest that *Z. desjardini* becomes a little paler as it matures compared to its cousin. Some authors also suggest *Z. velifer* retains stripes on its lower flanks as it matures while *Z. desjardini*'s stripes break up into spots.

Both species are, given my caveats about swimming room and aquarium size, relatively easy to keep, hardy, and long-lived.

Zebrasoma flavescens

The Yellow Tang is a mainstay in the aquarium world. It is easy to keep, inexpensive, relatively hardy, and often classified as a beginner's fish. I'd argue that it shouldn't be kept by complete

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A stunning, near-mature specimen of *Z. gemmatum*.

novices though and should be treated with as much respect and concern as any other fish.

Being one of the smallest of the Acanthurids, it is commonly kept in medium to large tanks and can readily adapt to aquarium life, as long as it is not bullied by related species and doesn't become a bully of later additions. I once kept a Yellow Tang and a Purple Tang in a 400-liter tank, and even though both specimens finally accepted each other, there was still some fin-flaring on occasion, especially when food was added.

The Yellow Tang has been the center of some controversy of late and has been the poster child for those wanting to limit or even ban their harvest from Hawaiian waters. I don't want to wade into this argument, but it has, perhaps, further galvanized the efforts of organizations and commercial companies that are seeking to raise captive-bred tangs. Admittedly, Yellow Tangs were only bred successfully for the first time last year, and seeing quantities of these captive-bred fish in your local store is not going to happen any time soon, but it's still a step in the right direction.

Yellow Tangs can often be a little stressed when purchased (as can many of their cousins) and can possess a pinched appearance

around the head area. It's worth taking note of what a healthy fish looks like. Remember, a fish that is stressed or ill can become susceptible to disease and thus a source of infection for other fish.

Yellow Tangs, like many of the genus, can form shoals in the wild. Yellow Tangs can also be kept in a group in a large tank as well, though don't expect much shoaling behavior; they will largely just do their own thing. The trick is to introduce five or six fish to the tank at the same time. Adding them separately is a recipe for the latest addition to become bullied into an early demise.

Zebrasoma gemmatum

The Gem Tang is an out-and-out beauty with tiny white spots scattered over a velvet-black to dark-brown body; it really is a stunner. Its desirability is further increased by its infrequency in the hobby, which makes Gem Tangs expensive.

This fish's rarity in the hobby is partly due to its limited range (where fish export businesses are not as well established as they are in other parts of the world) and the fish's own biology. Unlike the rest of its kin, this is a deeper-water dweller, being mainly found below 30 meters. Despite their often astronomical price tag, they are

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A younger Gem Tang, the background color seems darker on juvenile specimens.

considered as easy to keep as the ubiquitous Yellow Tang, and as long as they have a large enough tank to explore, with good water quality and suitable foodstuffs, they will do well.

Like the rest of their relatives, they can be aggressive with similar-sized and/or related fish, so treat them as potentially problematic. Needless to say, I could never afford one and have yet to see one in the wild.

Zebrasoma rostratum

The Black Tang is indeed a dark color. Though not always totally black, it may be very dark brown, and some specimens show faint longitudinal lines. Apart from that, the first thing you'll notice is that the fish has a slightly elongated snout that presumably allows it access to crevices where it grazes on filamentous algae.

This species is found across a fair bit of the Central Pacific but is reported as uncommon across its range. In fact, little is known about its population, and the International Union for Conservation of Nature (IUCN) lists it as "data deficient," which means it could be, unknowingly, at risk of extinction. If so, I imagine the aquarium trade has little to do with this since there are not

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Z. rostratum | Image by Sabine Penisson



Note the thin lines along the body of this *Z. scopas*; these are not seen in *Z. rostratum*.

a great number of individuals that find their way into the trade. Again, this is an expensive fish for those with deep pockets. However, it is reported to be easy to care for.

Interestingly, it has been reported as being able to breed with *Z. scopas*, which may cause further confusion in the case of some specimens, though I haven't personally been shown any specimens that are assumed to be hybrids.

Zebrasoma scopas

The Scopas Tang is something of a mystery. Some sources suggest it is merely a variety of *Z. flavescens*, though recent research at the DNA level suggests the species has recently diverged from the Yellow Tang and that we are seeing evolution in action. Some reports suggest that darker Scopas Tangs are passed off either unknowingly or intentionally as Black Tangs. One online account states that genuine Black Tangs have a greenish line that runs along the dorsal spine.

Scopas Tangs are quite variable in color, ranging from almost black to gray with their forward areas varying from light gray to yellow.

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They also change their coloration over time. Some specimens may be entirely white or yellow, which makes them difficult to separate from true Yellow Tangs at first glance. They are hardy fish if well cared for and well fed.

Zebrasoma xanthurum

This is my favorite of the genus. It's a fish I've kept and also one I've enjoyed watching in its Red Sea stronghold, where it can be seen in pairs or in large shoals of several hundred individuals when mating time approaches.

Z. xanthurum is spectacularly colored; its yellow pectorals and caudal fin contrast fantastically with a deep-purple body, overlain as it is with a delicate tracery of longitudinal stripes. In captivity, it is one of the most belligerent of the clan, so it might be a fish to keep as the only tang in a medium-sized tank or a fish to add last to a larger tank with other tang residents. Again, it is easy to acclimate to aquarium life, given the usual caveats. I have yet to hear of anyone keeping a group of them, but that may be due to their less than modest price tag.

WATER QUALITY

Water quality is, of course, the key to keeping any marine fish. But maintaining water that is well-oxygenated and free from organic pollutants is especially important with larger fish that expend a great deal of energy and produce copious amounts of waste.

In general, these are fish from the oxygen-rich regions of the reef, and they are accustomed to huge wave surges of clean water. I would recommend powerful circulation that replicates the surge and chaotic currents found on real reefs and a powerful and efficient skimmer that is regularly maintained. You might also want to employ a small ozonizer to speed up the breakdown of organics.

FEEDING

I suspect that most captive tangs are underfed. Only rarely do I see specimens in home aquaria that are as obviously healthy as those I see on the reefs. Having said that, I have seen some fish in public aquaria that have perhaps laid down a little too much body fat!


When you watch *Zebrasoma* fishes in the wild, you will realize just how far and wide they roam and how they spend nearly all their time grazing and picking at the rock. We must remember that these are active fish, and they need an awful lot of food to really thrive.

Try to provide them with as much marine algae as possible by using dried products such as *Porphyra* and *Spirulina*-enriched pellets or discs, offered on clips. Despite their supposed vegetarian status, *Zebrasoma* tangs will relish occasional meaty foods such as *Mysis*. I also recommend adding liquid supplements to some dried foods to increase the fish's uptake of vitamins and essential fatty acids.

Tang digestive systems are adapted to a diet of constant grazing, so they do pass a lot of material. Expect a lot of waste to be generated that will need to be removed and not allowed to build up in your aquarium.

DISEASE

Zebrasoma tangs can be at risk from disease. Like any fish, they become more susceptible in poor water quality and when they are stressed or their diet is lacking. Most fish will be treated by dealers for internal parasites, but external parasitic infections are regularly seen on tangs. Quarantine is always recommended, with medication and dips if necessary. Ozonizers are also beneficial in lightening the parasite load in the water.

In recent years, we have learned more about Marine Head and Lateral Line Erosion (MHLLE) disease, which seems to hit some members of the *Zebrasoma* clan particularly hard. This is a wasting away and general erosion of tissue around the fish's head, front dorsal fin (usually a Yellow Tang symptom), and lateral-line area. Its cause has been attributed to the fine particles from activated carbon in the water, low light levels, dietary deficiencies, poor water quality, or some form of causative pathogen. I have to say, though, that there are far better descriptions and accounts of this issue than any I might offer. 

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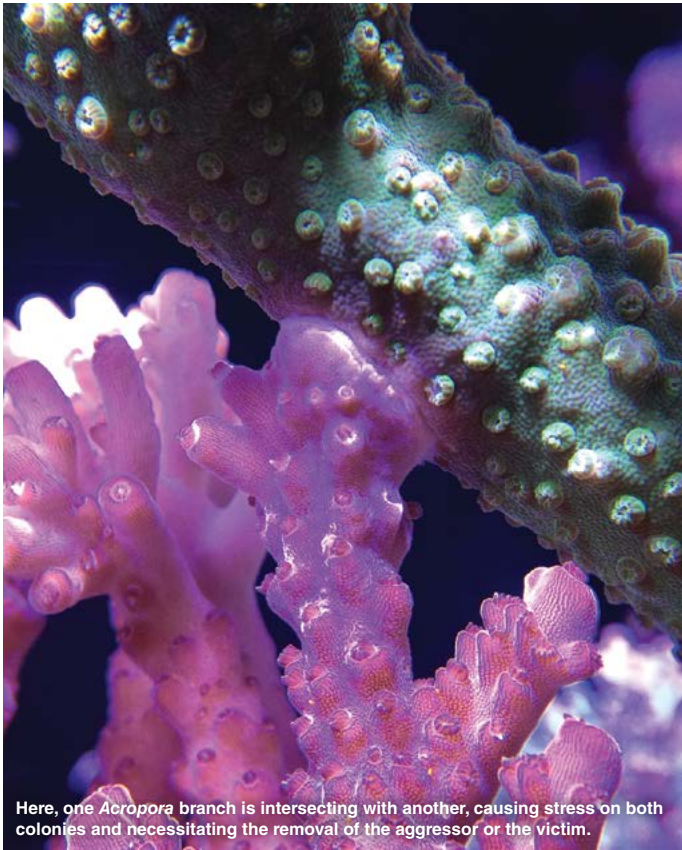




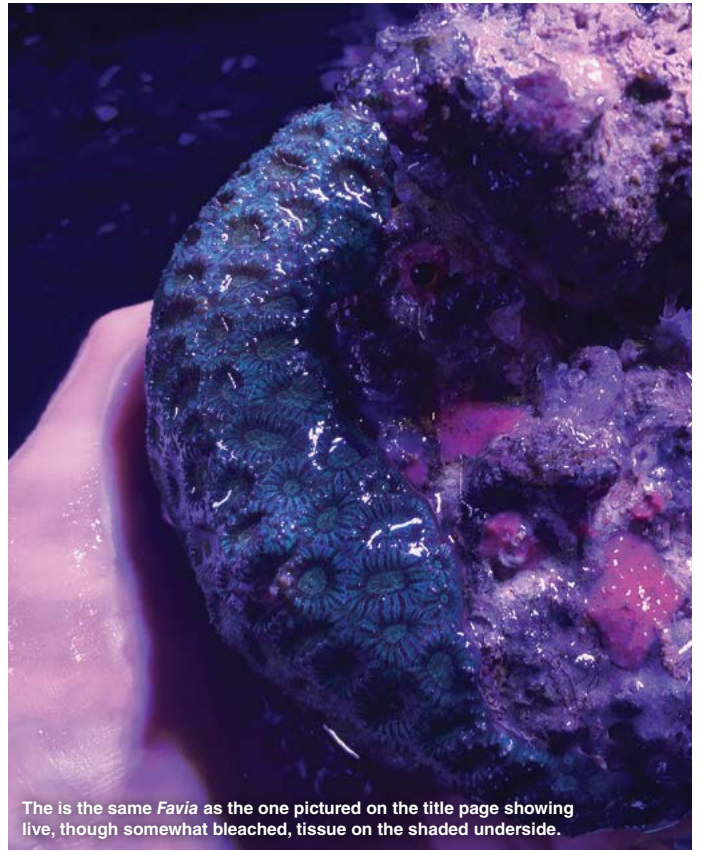
STRATEGIC FRAGGING:

PLANNING FOR SUCCESS

ADAM MULLINS



Here, one *Acropora* branch is intersecting with another, causing stress on both colonies and necessitating the removal of the aggressor or the victim.



This is the same *Favia* as the one pictured on the title page showing live, though somewhat bleached, tissue on the shaded underside.


There comes a time for every successful reef hobbyist when coral fragmentation becomes a necessity. Whether the reason is aesthetic or practical, you're eventually going to need to prune some corals or remove them from your tank. Sometimes, it's for the health of a coral colony or safety of an adjacent one.

Perhaps, a coral tries to encrust over its neighbor or a large branch shades older growth underneath. Or you might just want to trade a frag with another hobbyist. It's also a good form of insurance to have extra backup colonies of prized corals in friends' tanks or separate systems. Whatever your reasons to frag corals, here are a few strategic approaches.

It can be very hard for hobbyists to put their prized colony under the knife or saw. But there are ways to do it that will maintain the health and aesthetics of the corals involved. While zoanthids can be peeled and cut fairly inconspicuously, some of our slower-growing corals must be fragged with strategy and great care. The last thing we want to do is frag the new growth, just to leave the visible eyesore of a bare skeleton. This kind of lazy fragging can leave areas that are a haven for algal growth during the months it may take for tissue to heal over the wound.

A more thoughtful approach to fragging starts with the identification of areas where healthy tissue is growing underneath the rock, in the shadows, or on the backside of the reefscape, all perfectly suitable areas for harvest. A few well-placed cuts can liberate these light-deprived areas of coral, which will color up to full potential when


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This War and Peace *Favites* was mounted independently to allow for easy and worry-free encrustation, movability, and fragmentation.

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slowly acclimated to full lighting. This is a great way to frag massive encrusting corals like *Montipora* or large-polyped stonies (LPS) such as *Favia* and *Favites*.

For encrusting corals, anticipating how and where they will grow is one of the keys to successful fragging. Encrusting corals will spread onto anything they can attach to. This can make moving fragging them very difficult, if not impossible, without tearing apart the rock structure. It's for this reason that I like to grow my encrusting colonies on their own pieces of flat shelf rock or frag tiles, which can be moved around the reefscape as needed. By growing prized LPS (such as Raptor's Peace *Favia* or War and Peace *Favites*) in this manner, they can be easily moved in the event of coral warfare or when they need to be removed from the tank for fragging.

It doesn't take long in a stable tank for many of these corals to completely overgrow their frag bases or plugs and begin encrusting onto the live rock. Once it reaches the perimeter of the rock, a healthy coral can encrust around the edges of the base rock and grow underneath itself in a search for more real estate. Other corals, such as *Montipora setosa*, can continue growing upward and outward, creeping over themselves. The bottom or sides of these colonies are perfect and inconspicuous places to frag, and using a diamond band saw is one of the most versatile and safest ways to accomplish this.

The diamond band saw revolutionized coral propagation, although similar results can be achieved using Dremel-type rotary tools

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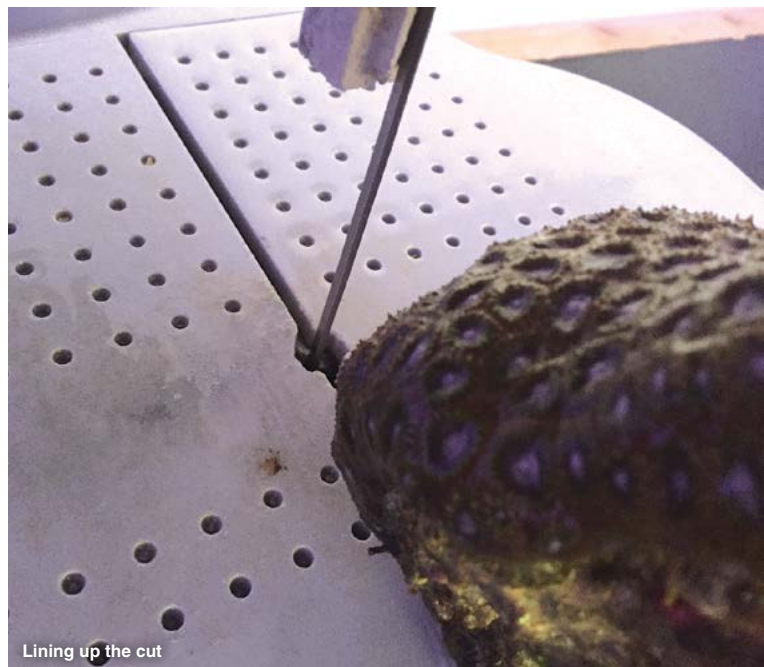
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Saw, containers of tank water, and frag tiles

with diamond cutting wheels. A wet band saw, though, has the advantages of being water-cooled and also being able to create very clean straight or intricate cuts. With fragile, brittle corals like chalcies, or when intricate individual polyp cuts are needed (such as with *Acanthastrea*), wet band saws are almost a necessity.



Lining up the cut

When planning your fragging, it's important to consider the regrowth of the coral. Encrusting corals will regrow and look more natural on an angled or contoured surface. Try not to leave sharp edges or 90-degree cuts on the side. Exposing more live tissue than necessary can cause severe damage and leaves both the frag and parent coral far more susceptible to infection. For encrusting LPS, it's a good idea to have a fresh sterile razor on hand to cut any flesh or tissue cleanly and avoid tearing.

The actual fragmentation is fairly straightforward once a plan is in place. Make sure to follow normal protocol with clean bowls of tank water for holding the coral and its fragments after they've been cut. A cleaning dip like ReVive is also recommended to help minimize the chance of infection. Don't transfer any fresh frags to a new system with different water parameters. Far more success will be had if they're allowed to heal in their old environment before transfer. The ultimate sign of good health is new growth, normally seen within a few weeks.

A similar method of fragging encrusting corals in a more passive way is to simply grow them on a larger rock or collection of frag tiles. Oftentimes, they will encrust onto these new surfaces fairly quickly at which point the new growth on the tiles or rocks can be easily popped off and remounted. This is an especially easy way to propagate zoanthids, and it's not uncommon to see little pyramids of 1-inch frag tiles in my store's propagation tanks. This is where I allow polyps like Rastas to grow onto new bases for fragmentation, leaving the original mother colony fairly unscathed and healthy.

Branching corals are especially easy to cut and prune in-tank with stainless steel bone shears. It's as simple as isolating a damaged or light-blocking branch and snipping it out of the way. Some finesse is required, especially with finely branched corals like some deep-water *Acropora*. Densely branched SPS corals can greatly reduce the amount of flow and light able to penetrate inside the colony.

What Really Bugs you ?

Whatever it is, a good bath will take care of it. **ReVive Coral Cleaner™** is a new type of coral dip solution developed by Julian Sprung. Its formula is based on powerful plant extracts, but it isn't harsh on coral tissues the way iodine-based dips are. For coral dipping prior to acclimation to aquariums, for rinsing prior to shipping, and for dipping newly fragmented corals, such as at coral farming facilities.



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The first cut to frag pieces from the colony's underside



The bottom side of the Favia where the frags were removed



The new frags recovering in a container of tank water

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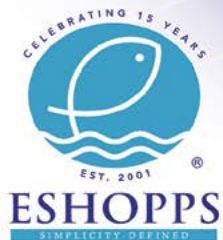


A rainbow *Favites* encrusting onto frag tiles

This lack of flow may allow detritus to settle in the colony, which can eventually damage it.

Next time you're fragging an established coral or positioning a new one, take some time to plan for its future growth. Have you

positioned it to allow for easy and aesthetic pruning? Is it a fast or slow grower? Where and how is it likely to grow? Does it have long sweeper tentacles that might threaten its neighbors? Always try to think of what future growth will bring. The next time fragmentation is necessary, I hope these tips will come in handy. 



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JASON ONEPPO

When discussing freeze-dried foods, the first thing that comes to mind for most people are the freeze-dried foods popular among the hiking and camping crowd. Freeze-drying was first developed in the early 1900s, but the popularity of freeze-drying surged during World War II when it was used to preserve and transport plasma, allowing it to remain stable and viable without refrigeration. Today, freeze-drying is used for nearly everything, from taxidermy to preserving human food for space travel, pet food (currently one of the hottest trends in natural dog foods), and even bacteria.

Freeze-dried foods are some of the most natural foods that can be offered to aquarium fish and reef inhabitants. The FDA's definition of a natural food is somewhat vague, and the guidelines are very loose. But they are currently under pressure to develop a stricter definition of what constitutes a natural food product.

Here is a quote taken directly from the FDA website on what the definition of a natural food product is. "From a food science perspective, it is difficult to define a food product that is 'natural' because the food has probably been processed and is no longer the product of the earth. That said, FDA has not developed a definition for use of the term natural or its derivatives. However, the agency has not objected to the use of the term if the food does not contain added color, artificial flavors, or synthetic substances."

This definition leaves a lot to interpretation. What one person may consider natural and unadulterated, another may not. I read it to mean that once an item is removed from nature and cleaned, it is no longer a product of the earth. Some ingredients that are classified as natural walk a fine line, and many people question whether certain ingredients should be considered natural or not. No matter what new definitions or regulations are put in place by the FDA, one thing is for sure: freeze-dried aquarium foods are as natural as it gets. Whole organisms are harvested, cleaned, frozen, and then freeze-dried; most people would consider these to be natural foods.

WHAT'S NEW WITH FREEZE-DRIED FOODS?

To answer this simply, not much! There are many types of freeze-dried foods available for the home aquarium. Some of these are excellent for marine fish and reefs while others should be avoided or used sparingly because of their freshwater origins and lack of proper nutritional profiles for marine organisms. The main products, which have been staples in the freeze-dried aquarium food category for the past 30 years, include plankton, krill, brine shrimp, *Tubifex* worms, and Bloodworms. In recent years, *Mysis* shrimp, *Cyclops*, and *Calanus* plankton have been introduced in freeze-dried form as well.

If you are a frozen-food user, freeze-dried foods are excellent to keep on hand to add variety or for emergencies, such as a power

outage or if you accidentally leave your frozen food on the kitchen counter where the whole supply thaws, in which case it should always be thrown away.

There are many hobbyists that don't use live or frozen foods at all, and freeze-dried is an excellent alternative for offering a varied diet. Some hobbyists purchase several different types of freeze-dried foods and mix them together to make a blend, and some manufacturers offer products that are mixes of several freeze-dried items. Freeze-dried foods not only offer variety in form and flavor but also texture, especially when compared to flakes and pellets.

THE EFFECT OF FREEZE-DRYING

The purpose of freeze-drying foods is to remove water for stability and storage while preserving as many of the benefits of the original product as possible. That's why rations for the military, backpackers, and astronauts all contain freeze-dried products. Nutritionally, freeze-dried foods are very similar to the original product once water is added and the food is reconstituted.

The main differences between freeze-dried and dehydrated foods are that freeze-dried foods maintain much of their original nutritional value due to their low processing temperature and typically do not shrink in size or toughen in texture. Most dehydrated foods



Freeze-dried brine shrimp

are dehydrated at a temperature of 130° F or higher. Above 126° F, fats will deteriorate and vitamins will degrade.

AVAILABLE FREEZE-DRIED FOODS

Brine shrimp, one of the first freeze-dried fish foods, has been around for ages and is still a popular product with excellent nutritional value. It is not only heavily used in the aquarium hobby but also in aquaculture for feeding broodstock as well as in larval feeds. In recent years, freeze-dried brine shrimp with *Spirulina* has been introduced due to the popularity of frozen brine shrimp with *Spirulina*. Even brine-shrimp eggs are available in freeze-dried form. Brine shrimp is an excellent main diet for carnivorous, omnivorous, and planktivorous fish (small to

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Freeze-dried krill



Freeze-dried plankton and desiccant

medium sized) and as a supplement for corals, anemones, and other invertebrates. It also makes an excellent broadcast food for filter feeders.

Krill (*Euphausia superba*) contains extremely high omega-3s, astaxanthin (a carotenoid necessary for the vibrant colors of tropical fish), lipids, essential fatty acids, and amino acids required for biological processes. Some companies add vitamin E as a nutritional boost to their freeze-dried krill. Krill is an excellent main diet for carnivorous and omnivorous fish (medium to large sized) and works well as a supplement for corals, anemones, and other invertebrates.

Plankton (*Euphausia pacifica*) is high in beta-carotene (a carotenoid that brings out the color of your fish), lipids, and essential fatty acids, and it also contains amino acids required for biological processes. Plankton is recommended for carnivorous and omnivorous fish (small to medium sized) and as a supplement for corals, anemones, and other invertebrates.

Mysis is one of the more recent freeze-dried items to be introduced to the hobby. It first secured its popularity as a frozen food with its ability to entice finicky feeders. Most, if not all, of the freeze-dried *Mysis* offered in the market is from marine or brackish waters. I have seen many samples of freeze-dried *Mysis* shrimp collected from different regions around the world, and their appearance can vary greatly. Depending on time of year and source, there can be a lot of variation in the product color, which is difficult to control. For some reason, *Mysis* shrimp from the freshwater lakes in Canada don't seem to hold up well through the freeze-drying process. Maybe it's due to the high fat content, which causes the product to be oily. Freeze-dried *Mysis* is excellent for finicky feeders such as butterflies and angels, and its small size also makes it an ideal food for fish such as anthias, while also being well sized for corals, anemones, and other invertebrates.

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Freeze-dried *Daphnia*

Freeze-dried Bloodworms



Freeze-dried *Cyclops*



River Shrimp, *Daphnia*, and *Gammarus* are generally not recommended as food for marine species. But I still thought it was important to cover them here for just that reason. They have very little nutritional value and are not very popular products among marine aquarists, although *Daphnia* is often touted for its ability to act as a laxative for constipated fish. If you do decide to use these products in your marine aquarium or reef, it is important that you pay attention to what you are purchasing and purchase only freeze-dried products, since these products are also offered as air-dried. The process for air-drying is to simply lay the product on the side of the road on burlap sacks and let them dry in the sun. Obviously, this allows for bacterial growth that could be harmful, but believe it or not, the majority of the river shrimp prepared in this manner are sold for human consumption!

Freeze-Dried Worms—Bloodworms (*Chironomus plumosus*), *Tubifex* worms (*Tubifex tubifex*), and Blackworms (*Lumbriculus variegatus*) are popular freshwater foods, with Bloodworms possibly even exceeding the popularity of brine shrimp. However, freshwater foods are generally not recommended for use in marine aquariums due to their lack of nutrition and the risk of introducing pathogens that are harmful to marine organisms but not freshwater fish. The aquarium stores where I worked when I was a teen strictly prohibited feeding Blackworms (especially live ones to marine fish in the store) or recommending them to marine customers. Many hobbyists, however, will use these items to get finicky eaters to start feeding when first acquired. *Tubifex* worms live in the mud on the bottom of sometimes polluted rivers and lakes, and that is the reason fish-food companies have an extensive disinfection process for these worms that includes the use of UV and other methods. *Tubifex* are gamma irradiated after being freeze-dried since the freeze-drying process preserves everything, including potentially harmful bacteria.

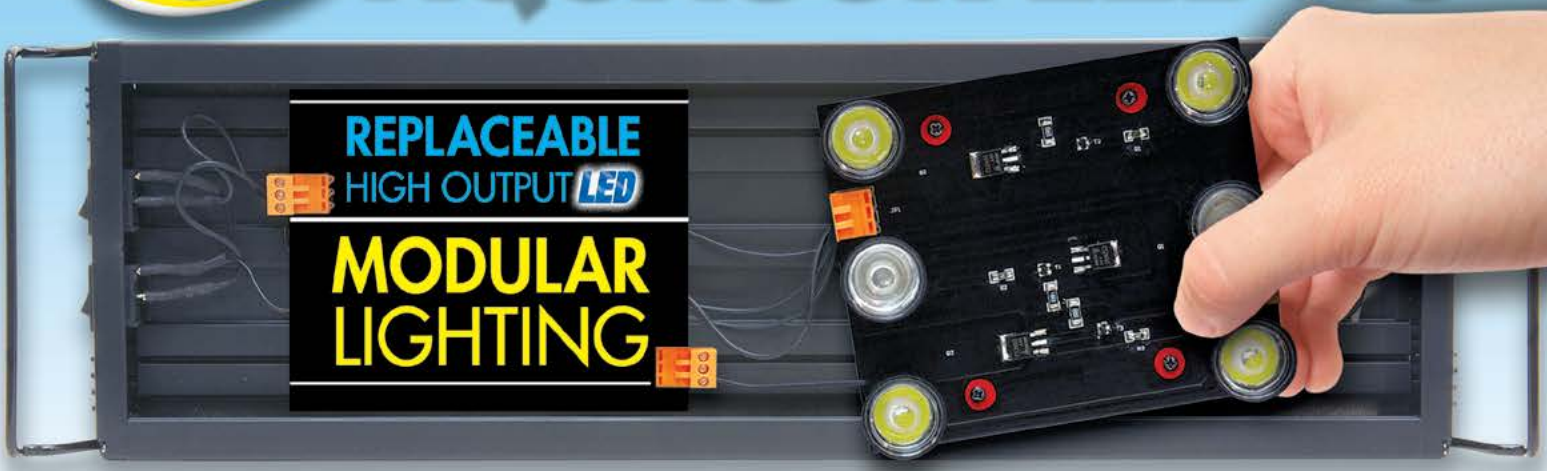
Cyclops became a popular marine and reef food due to Cyclop-Eeze. That frozen product led the way to freeze-dried *Cyclops*. *Cyclops* are still available today under many other name brands, although they lack the same nutritional profile and red coloration of Cyclop-Eeze from Canada. *Cyclops* are an extremely appropriate food item for marine organisms. They are perfect for broadcast feeding in reef aquariums and also make an excellent food item for planktivorous fish, small fish, and fish larvae.

***Calanus* (*Calanus finmarchicus*)** plankton is a large species of copepod (0.08–0.16 inches) that was first introduced to the U.S. market as a frozen food around 10 years ago, although it was previously available in Europe. It contains abundant omega-3 and omega-6 fatty acids and astaxanthin. It is one of the most abundant species of marine copepod and is an integral part of the food web. One important thing to note is that it is a very natural, extremely appropriate food for reef aquariums and is sustainably harvested off the coast of Norway. It was first offered in Europe as a freeze-dried product several years ago and has now been introduced to the American market by several well-known and innovative companies that make quality products for marine and reef aquariums. Many finicky fish, such as butterflies and anthias, easily take to this food item in captivity. These are an excellent source of nutrition for any planktivorous or small fish, as well as filter feeding corals and invertebrates.

Freeze-dried blends often incorporate different freeze-dried ingredients (usually some form of copepod and *Euphausia superba*) for marine and reef aquariums, most targeted toward filter feeders and corals. These are an excellent choice for people who don't want to deal with frozen foods, and they have a longer shelf life than liquid feeds that require refrigeration have.



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Brine shrimp being rehydrated in water



Coral skeleton with freeze-dried food inserted

USES FOR FREEZE-DRIED FOODS


Freeze-dried foods have many uses. If stored properly, they can outlast most other foods while retaining their nutritional value, which makes them invaluable food items that all reefers and marine hobbyists should keep on hand.

It has become popular for hobbyists to use liquid vitamins or supplements, such as garlic extracts, to enhance the nutritional value of food items. Although it is often recommended to mix these items with frozen or pelletized foods, it is much more effective to do so with freeze-dried foods. Having had the moisture removed from them, freeze-dried foods quickly absorb liquid additives, ensuring that these additives are ingested when the foods are consumed. When one mixes these additives with frozen foods, it is fairly ineffective since frozen foods have likely already reached their maximum moisture content, causing a lot of the supplements to simply be dispersed in the water column. Granted, you could marinate your frozen foods and get better results, but who wants to go through all that work when there is a quicker, easier, and more effective alternative? This method can also be applied to powdered medications by dissolving the medications in RO/DI water and then allowing the freeze-dried product to absorb the solution.

Freeze-dried items also work well in automatic feeders. They can be used as a single item, mixed together, or mixed with flakes and pellets to offer variety. This is a great alternative for people that usually feed frozen food but have to rely on an automatic feeder when they travel or during the day while at work. Freeze-dried foods in auto feeders are a very popular option used by many aquarium maintenance companies.

An old trick for getting finicky marine fish to feed involved the use of freeze-dried foods. Unfortunately, it also involved the use of coral skeletons that were usually the remains of corals that perished in our aquariums. What we would do was use the skeleton of a coral, such as a *Goniopora* or brain, and push some freeze-dried brine shrimp or krill into it. Then we would place it on the bottom of the tank hoping it would trigger a natural feeding response. Sometimes it worked and sometimes it didn't, but it was always worth a shot when you had a fish that was reluctant to feed.

Another use for freeze-dried fish foods is feeding corals and filter feeders. While items such as krill can be used to soak up supplements and fed directly to corals and anemones that like to feed on large meaty items, freeze-dried foods can also easily be crushed into a powder. Smaller freeze-dried items such as *Calanus* and *Cyclops* can be used whole and soaked in RO/DI water, vitamins, or supplements to target or broadcast feed to corals and filter feeders.

Freeze-dried aquarium foods offer similar nutritional value when compared to frozen but with the convenience of flake or pellet food. They have many uses and are an invaluable addition to any feeding regimen, as a back up to frozen, or for use in automatic feeders. There are many items that would make interesting freeze-dried foods that are not yet on the market. There are some that have been tried and worked well but found to be cost prohibitive and never went past the R&D phase. I have worked with a lot of interesting and sometimes peculiar freeze-dried foods that fish and inverts went bananas for that will never see the light of day as a product. But then again, that's one of the exciting things about working in the industry. So we'll end this piece here, and as always, keep it real, fishes! 



Freeze-dried brine shrimp powder



Freeze-dried brine shrimp powder with water added

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Flow rates vary by attachment

Model	Watts	Free Flow	Small Fish Guard	Medium Fish Guard	Diffuser
Koralia 1350	5.5	1350 gph	950 gph	1100 gph	1050 gph
Koralia 1950	6.3	1950 gph	1250 gph	1500 gph	1350 gph
Koralia 2450	8.5	2450 gph	1600 gph	1850 gph	1750 gph





inside a predator's reef

FELICIA SVEDLUND, PhD





Snowflake Eel



Fu Manchu Lionfish

I've been involved in the aquarium hobby ever since I was 4 years old when my dad helped me set up my first freshwater tank. I've had freshwater aquariums all my life, but being an avid scuba diver, I've always wanted a saltwater tank to be able to have my own piece of the ocean at home. Back in 2011, a friend directed me to the online forums, which made me realize that it was possible to keep a successful reef tank that was small enough for my apartment and my budget. I've been hooked on the saltwater reef aquarium hobby ever since, and I have had several different tank setups over these last 4 years. After a tank crash and several setbacks, I was discouraged and burned out, so I wanted something new to reignite my passion for reef aquariums. After some research, I decided to try something unique and house lionfish in a mixed-reef environment.

SYSTEM PROFILE

Established: February 15, 2015

Gallons: 40

Display: Tetra breeder aquarium (36" W x 18" D x 17" H)

Stand: Aqueon

Sump: DIY 20-gallon (30" W x 12" D x 12" H) tank with 3 chambers and auto top-off reservoir

Skimmer: Reef Octopus NWB110

Filtration: Filter sock; Phosban 150 media reactor; Two Little Fishies NPX biopellets

Return Pump: Jebao DC-3000 (max flow 794 GPH)

Circulation: (2) Vortech MP10s

Lighting: Maxspect R420R 16,000 K

Dosing: Jebao DP-4; ESV B-Ionic Alk, Ca, and Mg; Two Little Fishies AcroPower

Auto Top-Off: JBJ ATO controller; Tom Aqua Lifter pump

Water: BRS 5-stage RO/DI system; 5 micron Purtrix sediment filter; catalytic activated carbon; ChlorPlus 10 carbon block; Dow Filmtec 75 GPD reverse-osmosis membrane; color-changing DI resin

Heating: Finnex 300-watt deluxe titanium heating tube; Finnex Max-300 digital heater controller

Rock/Sand: 28 lbs. of cured live rock; 10 lbs. Real Reef rock; 40 lbs. of Fiji Pink sand

WATER CIRCULATION AND FLOW

In addition to the flow from my return pump, I have two Vortech MP10s. One is on the left pane of glass, and one is on the back pane. Both are set on Reef Crest mode to create a random and constantly changing flow pattern. I set up my MPs to produce enough flow everywhere and prevent detritus buildup, but I wanted to have some areas with higher flow and some areas with a bit lower flow since my goal was to house a mix of different coral types. I also had to take into consideration the flow requirement for the gorgonians. They need high flow to help them shed periodically and to prevent algae from settling and growing on their skin.

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WATER PARAMETERS

Temperature: 79° F

pH: don't test

Specific Gravity: 1.025

Ammonia: don't test

Nitrate: 5–25 ppm

Nitrite: don't test

Phosphate: 0–0.03 ppm

Calcium: 450 ppm

Alkalinity: 10 dKH

Magnesium: 1,400 ppm

LIGHTING SUMMARY AND OBJECTIVES

I am a huge fan of LED fixtures because of their bulb cost savings, energy efficiency, and low heat output. I really like the Maxspect Razor fixtures because they are relatively inexpensive and have the

light schedule programming function built right in. It's super easy to set up the lighting schedule and to make changes when needed. Also, at the touch of a button, I can switch to a manual mode where I have preset the white and blue channel balance to be better for photography.

Photoperiod (A is the white channel and B is the blue channel)

12:00 a.m. to 1:30 p.m.—A: 0% and B: 0%

1:30 p.m.—lights turn on slowly

3:00 p.m.—A: 40% and B: 60%

4:00 p.m. to 10:00 p.m.—A: 90% and B: 100%

11:00 p.m.—A: 0% and B: 60%

12:00 a.m.—A: 0% and B: 0%



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Wireless: Optional



MP40QD

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Tank Size: 50-500+ gallons
(190-1,900+ liters)
Wireless: Included



MP60QD

Flow: 7,500 gallons
(28,000 liters) per hour
Tank Size: 120-1,000+ gallons
(450-3,800+ liters)
Wireless: Included



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FILTRATION AND WATER QUALITY

Currently, my routine is a bit sporadic because life has been hectic, but I try my best to stick to weekly water changes and maintenance. During the weekly cleaning, I test the water parameters (alkalinity, calcium, magnesium, nitrates, phosphates), change 10 gallons of water, replace the filter sock, clean the skimmer cup and neck, scrape the glass, manually remove any algae growth

in the display, turkey baste detritus off the rocks, and siphon the sand bed.

I have a small refugium in the sump that includes some rubble rock and *Chaetomorpha*, but my main filtration is from my biopellet reactor and skimmer. I was originally running a mix of GFO and carbon in my reactor, but shortly after I got the lionfish, I decided to try out biopellets. The biopellets work really well on this system because my tank tends to have high nitrates from feeding the predator fish. Biopellets function on the Redfield Ratio, which means that there is a 16:1 ratio of nitrates to phosphates in terms of reduction. Therefore, if you want to reduce phosphates with biopellets, you also need to have a lot of nitrates to reduce. Having a biopellet reactor means that I need to have a very effective and powerful skimmer. I chose a skimmer that is rated for tanks over twice the size of mine and have been very happy with it.



Tomini Tang

TANK INHABITANTS

Fish

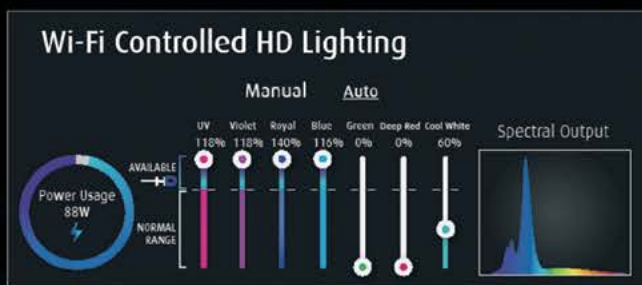
- Fu Manchu Lionfish (*Dendrochirus biocellatus*)
- Dwarf Zebra Lionfish (*Dendrochirus zebra*)

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Dwarf Zebra Lionfish

- Antennata Lionfish (*Pterois antennata*)
- Snowflake Eel (*Echidna nebulosa*)
- Darwin Ocellaris Clownfish (male) (*Amphiprion ocellaris*)
- Ocellaris Clownfish (female) (*Amphiprion ocellaris*)
- Tomini Tang (*Ctenochaetus tominiensis*)

Other Invertebrates

- Bubble-tip Anemones (*Entacmaea quadricolor*)
- (2) Squamosa Clams (*Tridacna squamosa*)
- Derasa Clam (*Tridacna derasa*)
- (2) fighting conchs (*Strombus* sp.)
- Ruby-red Mithrax Crab (*Mithrax ruber*)
- Serpent Starfish (*Ophiolepsis* sp.)
- Scarlet Reef Hermit Crabs (*Paguristes cadenati*)
- Turbo Snails (*Turbo* sp.)
- Tuxedo Urchin (*Mespilia globulus*)

Corals

- Gorgonians
- Angular Sea Whip (*Pterogorgia anceps*)

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Antennata Lionfish

- Purple Sea Feather (*Pseudopterogorgia* sp.)
- Yellow Sea Feather (*Pseudopterogorgia* sp.)
- Knobby Sea Rod (*Eunicea* sp.)
- Purple Sea Rod (*Plexaura flexuosa*)
- Purple Plume Gorgonian (*Muriceopsis flavida*)

Sponges

- Yellow Ball Sponge (*Cinachyra* sp.)
- Yellow Frilly Sponge (*Halichondria* sp.)
- Blue Photosynthetic Sponge (*Collospongia* sp.)

Soft Corals

- Assorted zoanthids and *Palythoa* (*Zoanthus* spp., *Palythoa* spp.)
- Assorted leather corals (*Nephtea* sp., *Sinularia* sp., *Sarcophyton* sp.)
- Colt Coral (*Klyxum* sp.)

- Pulsing Xenia (*Xenia* sp.)
- Mushroom corals (*Rhodactis* spp.)

Large-Polyp Stony Corals

- Frogspawn (*Euphyllia divisa*)
- Duncan (*Duncanopsammia* sp.)

Small-Polyp Stony Corals

- Assorted *Acropora* (*Acropora* spp.)

FEEDING

Two of my lionfish were only eating live food when I first purchased them, so they had to be weaned from live ghost shrimp to frozen *Mysis*. Now, all of my tank inhabitants are exclusively eating frozen food. I feed the lionfish and eel 2 to 3 times per week, since this is how they would eat in the wild. I purchase a selection of fresh seafood from a local seafood market and make my own frozen cube blend that includes prawns, squid, clams, scallops, salmon, and silversides.

At each feeding, I feed one cube of my homemade blend along with one cube of PE *Mysis*. The PE *Mysis* is also for my clownfish and corals. I do not target feed any corals, but I dose AcroPower every other day using one channel of my dosing pump.

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ADVICE TO NEW HOBBYISTS


At the risk of sounding cliché, my main advice is to do your research and read, read, and read some more. However, you should always consider the source and don't believe everything you read online. Make sure you're finding experienced and reputable sources of information. Utilize the online forums to their fullest. They're a great place to get advice and make tons of connections in the reef aquarium hobby. Finally, don't be afraid to go against the grain and try something new! Just make sure you do your research first, and make sure you have a plan to help you succeed.

FUTURE PLANS

I have had the lionfish for a little over 6 months now, and they are doing great and have become my favorite fish species.

I am very happy with this tank, so I do not have any immediate plans for an upgrade. I'm going to enjoy the tank while I give it time to mature and continue to fill in. At some point down the line though, I plan to upgrade to a larger system to house the lionfish and eel as they grow. I'd also like to be able to add more species of lionfish.

If you're looking for something unique or different, I really recommend the dwarf lionfish species. They're able to be housed in modestly sized aquariums, are very hardy, and have amazing personalities! They're also beautiful fish and are so much fun to feed. A lot of people keep predator fish in FOWLR (Fish Only With Live Rock) systems, but I highly recommend keeping them in a mixed-reef environment. They live on reefs in the wild, so it is much more enjoyable to see them in a beautiful, natural environment. They are completely reef safe and do not harm any corals or clams. However, they can eat anything that is $\frac{3}{4}$ of their size or smaller, so you have to be willing to not keep any shrimp or small fish. The only other consideration is to make sure you have very good filtration because feeding predator fish creates a lot of excess nutrients. As long as you take these requirements into consideration, lionfish are a great addition to a reef aquarium, and I highly recommend them.

I would like to thank my Dad for inspiring my interest in the aquarium hobby. I'd also like to thank my friends on the aquarium forums and in my local club. 



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One Bad *Pectinia*

MINDY VAN LEUR

At MACNA 2013 in Miami, I kept seeing these weird neon-green and neon-yellow lumps on frag plugs in several vendors' booths. These things were bright! Under the actinic blue lighting of a coral trade show, these neon lumps could be picked out in the racks from across the room. The frags were too small for me to be sure of an ID on the species, but I later learned these little fluorescent lumps were Tyree Space Invaders *Pectinia*. This *Pectinia* wasn't super new to the U.S. reefing scene at the time, but

up in Canada, we hadn't seen anything like it. At about \$250 for a $\frac{3}{4}$ " round frag, it wasn't a cheap little lump either.

A month later, I had totally forgotten about this coral when a chance came up to purchase my own neon lump in Canada. I jumped at the opportunity once I remembered what this *Pectinia* thing was. At the time, it was the most money I had ever spent on a small frag—never mind a lump! Little did I know that this tiny lump would grow into a swan that would come to delight not only my heart, but the eyes of many an onlooker!



A Space Invaders colony in lower flow | Image by author

I rarely feed my *Pectinia*, so it doesn't grow very fast. It's been tolerant of low- or medium-intensity light in the range of 150–300 PAR. Like many other corals, this morph becomes lighter colored in brighter light and darker colored in lower light. It is a very hungry coral though, and it loves to eat! My *Pectinia* has a tendency to puke out coral pellets when I'm not looking, but it loves thawed *Mysis* shrimp. This coral has been very hardy for me, successfully surviving two mini crashes. Both times, it receded to nearly nothing but came back quite quickly. It is currently housed in a high-light, high-flow SPS tank. Previously, I had the coral in a lower-flow, lower-light soft-coral frag tank. It has done equally well in both tanks and is not fussy at all. However, be warned! This coral has some mega sweeper tentacles!

In the last 18 months or so, I've cut a number of frags off my mother colony. This coral doesn't deal too well with being handled. The skeleton is very sharp; it will poke through the flesh anywhere that you grab onto, so care must be taken when handling it. On my *Pectinia*, the skeleton is very soft at



The Swan colony | Image by author

Notice the difference in growth patterns between The Swan colony and the colony above it. I'm not 100% sure why, but I have a theory. Both corals were from the same mother colony, and both of the frags were taken at the same time. The first colony photo was taken in June, and The Swan photo was taken in August. Midway between, in July, I moved my livestock from an old tank into a new tank, including the *Pectinia*. The old tank was a lower-flow, lower-

light tank used mainly for soft coral frags. The new tank was SPS-based with high light and high flow. The new tank is where this coral quickly started showing a spikier growth pattern. So my theory is that when this *Pectinia* is exposed to high flow (about 75x turnover in this tank), it holds its flesh tighter to the skeleton so it doesn't get damaged by the flow. If I turn the powerheads off for half an hour, the *Pectinia* puffs right up and looks similar to the first *Pectinia*.

This is one hungry Space Invaders *Pectinia*!
Image by Scott Chapman



the outer edge (roughly the outer inch) of the colony, but as soon as you get into any thicker areas, the skeleton is much denser.

The first time I tried making a frag, I used a pair of coral fragging shears—bad idea! The skeleton shattered, and it was left hanging inside the skin. I cut the skin with a blade, and the remaining frag took a long time to heal since it was all broken inside the skin, but it did survive! I felt terrible and was scared to try again. My second fragging attempt went much better; I used a diamond blade on a rotary tool. When cut, it creates about a pound of slime. I'm sure of it. Haha! I find that the frags take a while to heal, and there is usually some recession on the cut edge. I haven't lost any frags yet though, so even though they look much worse for wear in the first week or two, they eventually heal up and do well. I've also shipped several frags, and they've arrived in tip-top condition. They don't fade in shipping and seem to deal easily with different tank conditions.

The Tyree Space Invaders *Pectinia* is relatively easy to propagate, stupidly bright, fast growing, and hardy. What more could you ask for? It's actually a great beginner LPS coral too. I think this *Pectinia* will become a market staple in Canada in the next few years. I don't think it will ever be an inexpensive coral, but I do think 5 years from now, a lot of people will be enjoying it in their tanks. If you

can't tell already, I'm a big fan of the Tyree Space Invaders *Pectinia*, and even though I'm really an *Acropora* fanatic, this LPS coral will always have a special place in my little ocean realm!

Keep on reefin' on! 



Image by Reeffarmers

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— **Rich Ross**, Senior Biologist, Steinhart Aquarium, California Academy of Sciences; Marine Societies of North America (MASNA) 2014 Aquarist of the Year



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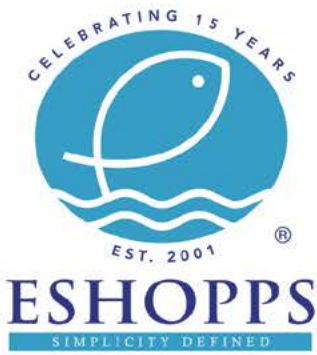
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