REEF HOBBYIST MAGAZINE

FOURTH QUARTER 2016 | VOLUME 10

Plectranthias pelicieri:
ONE ASTONISHING PERCHLET

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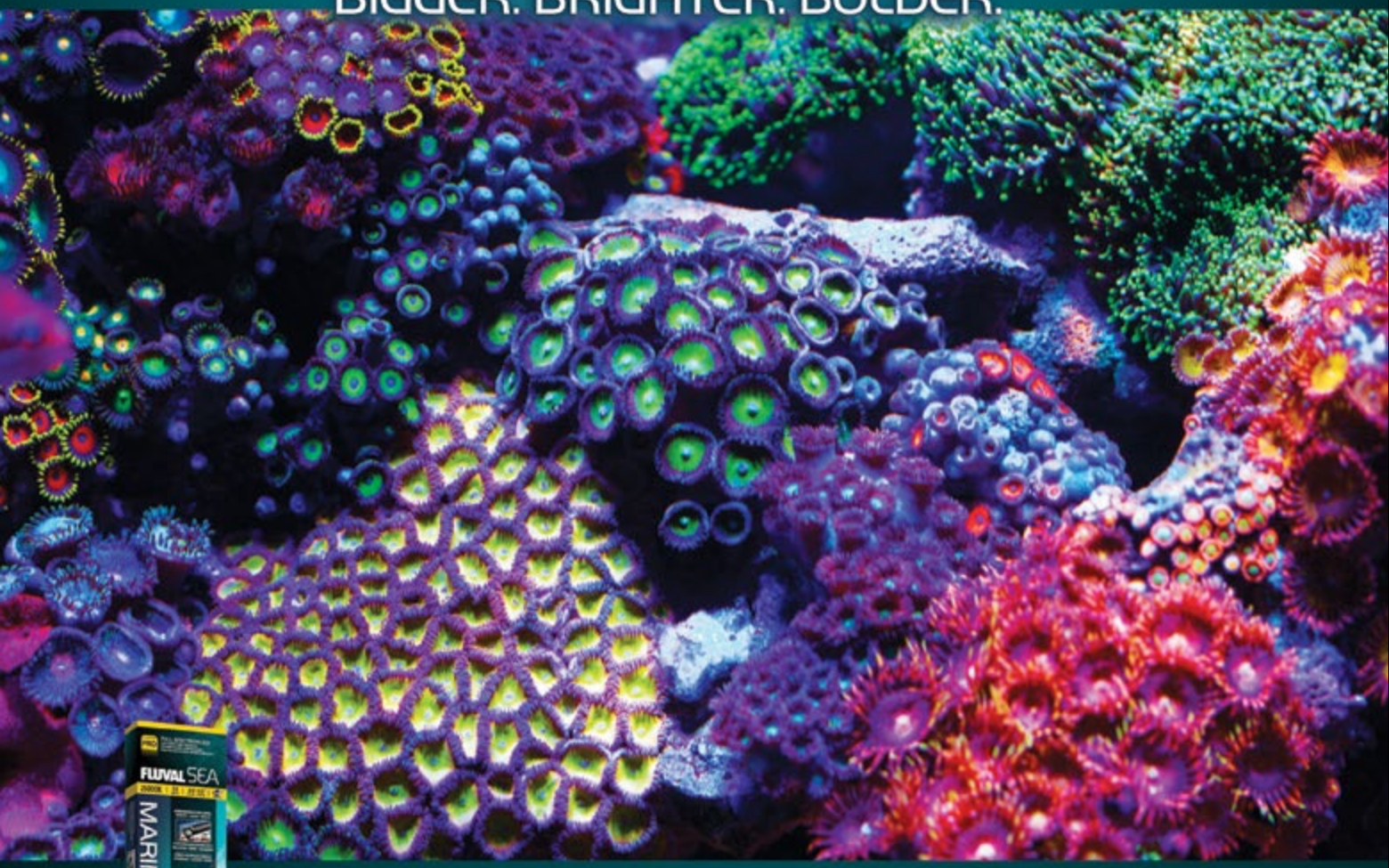

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FEATURES

42 ON THE COVER

BÜLENT'S HIGH ENERGY REEF

M Bülent Özcan is an associate professor from the U.K. specializing in software engineering and has been in the hobby since 2008. The replication of a high energy reef environment for SPS requires attention to specific details, as explained here.

Cover image by author

FOURTH QUARTER 2016 | Volume 10

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- **Lonestar Marine Aquarist Rally:** November 6, San Antonio, TX
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Acanthastrea echinata

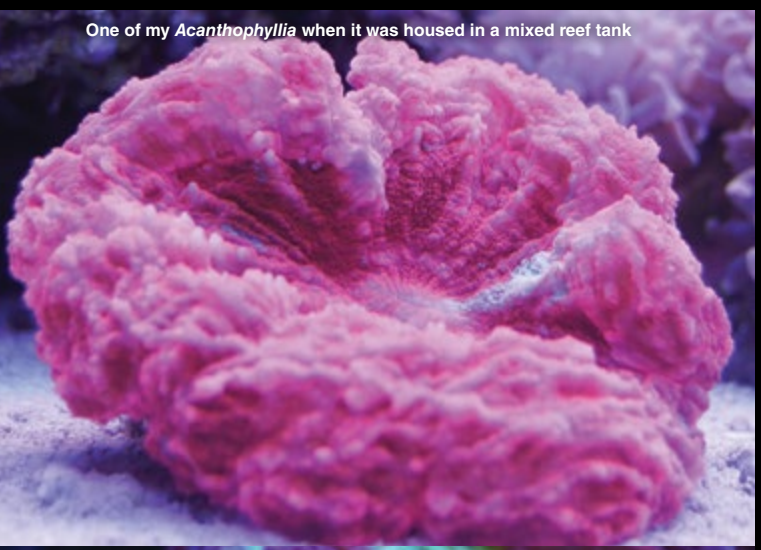
DEBORA DŁUGOPOLSKA

Keeping LPS Happy

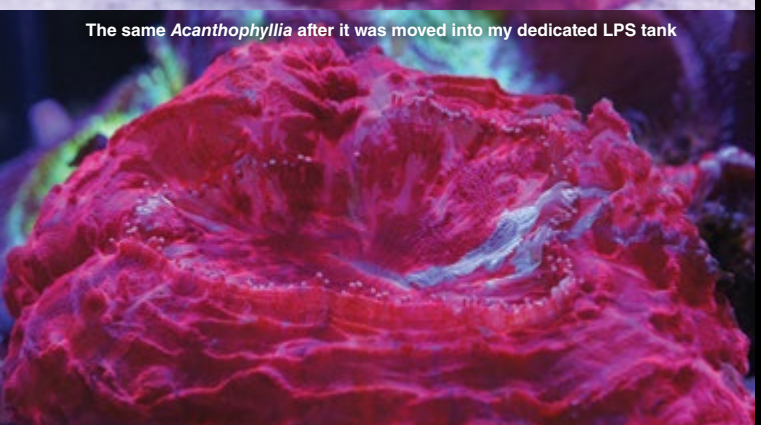
Ever since I can remember, I have always loved LPS (large-polyped stony) corals. When I first started in the hobby, like so many people, I had a mixed reef tank. I kept LPS with SPS (small-polyped stony) corals, but I wanted to have more color in my *Acropora* corals, so I decided to remove all the LPS from my tank. This involved creating a separate tank for my LPS, and that was the best decision I ever made. Because I was able to focus on my LPS separately, these corals plumped up like never before.

PROFILE:

Display: 24 in × 24 in × 20 in
Volume: 47 gallons
Skimmer: Aquaforest 160
Water Flow: (2) Tunze 6055 waveboxes



One of my *Acanthophyllia* when it was housed in a mixed reef tank



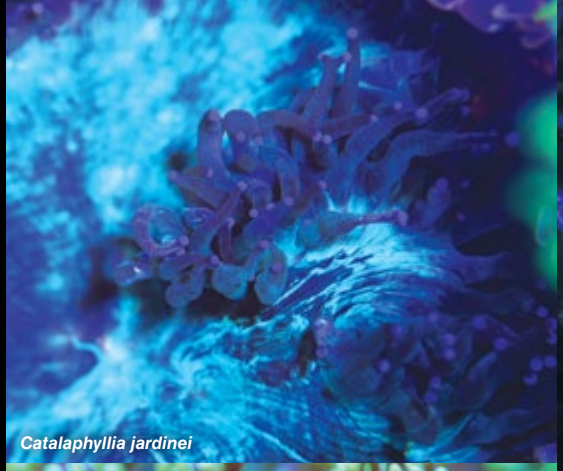
The same *Acanthophyllia* after it was moved into my dedicated LPS tank

WATER PARAMETERS:

Salinity: 33 ppt
Calcium: 400 ppm
Magnesium: 1230 ppm
Carbonate Hardness: 6.8 dKH
Nitrate: 5 ppm
Phosphate: 0.05 ppm

For this system, I do water changes every 2 weeks with Aquaforest (AF) Probiotic Reef Salt. I feed my corals every other day with frozen green and red plankton, AF Power Food, AF Ricco Food, and AF Phyto Mix. In my experience, I noticed that my LPS corals love amino acids and iodine; as a result, I dose AF Amino Mix and Iodum. Sometimes, I target feed some of the corals, like my *Scolymia* and *Plerogyra*, but generally, I just pour food into the aquarium so that the corals can catch it for themselves.

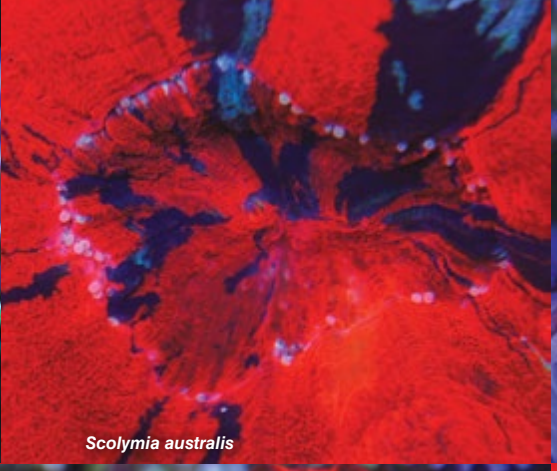
LPS corals love to eat, which is why it's important to feed them


Catalaphyllia jardinei


Caulastrea furcata

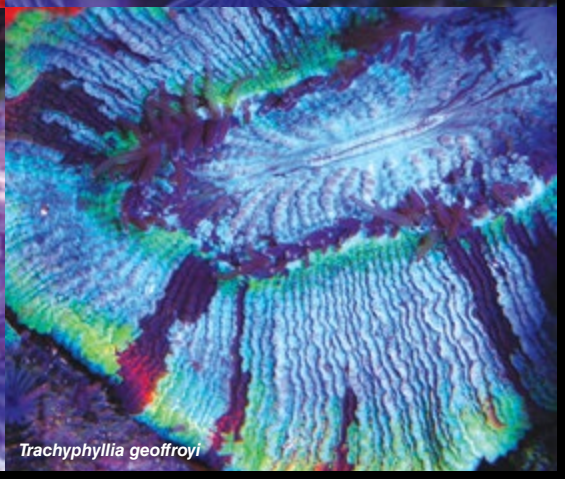

***Goniopora* sp.**


Scolymia australis


Scolymia australis


Blastomussa wellsi


Blastomussa wellsi


Trachyphyllia geoffroyi

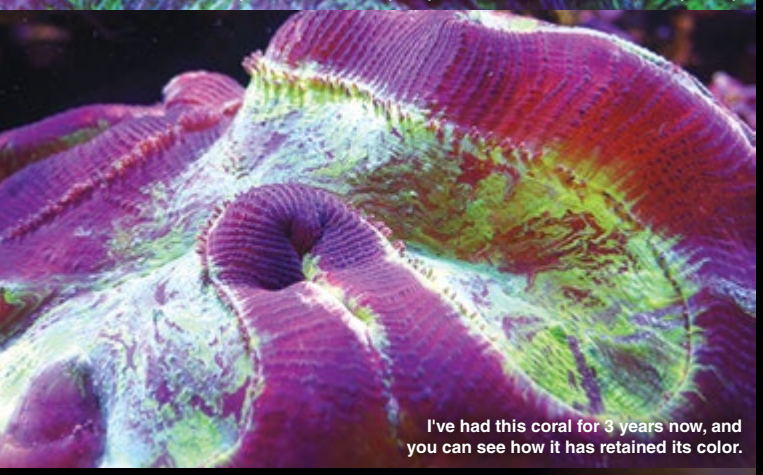
as much as practical. Well-fed corals tend to grow bigger, healthier, and more colorful, as long as good water quality can be maintained. With heavy feeding, it is critical to control the elevated phosphate and nitrate levels that result. I use AF Pro Bio S and -NP Pro to add specific strains of bacteria into my system that convert phosphate and nitrates into nutrients that can be skimmed out or consumed by my livestock. My skimmer and probiotic salt do the rest.

In my fluidized filter (AF90), I utilize Zeo Mix (50 ml) to reduce ammonia, Carbon (50 ml) to remove chemicals, and Phosphate Minus (50 ml) in order to adsorb silicates and phosphate.

CORALS:

- (3) *Acanthastrea lordhowensis*
- (2) *Acanthastrea hemprichii*
- (2) *Acanthophyllia*

This is the best example of how the same LPS coral can look completely different when kept in a mixed reef (here) versus a dedicated LPS tank (below).



I've had this coral for 3 years now, and you can see how it has retained its color.

***Scolymia australis* feeding at night**

Plerogyra sinuosa

Physogyra lichtensteini

- (4) *Blastomussa wellsi*
- *Blastomussa merletti*
- *Catalaphyllia jardinei*
- *Caulastrea furcata*
- (6) *Euphyllia: ancora, paradivisa, glabrescens, yaeyamaensis,* (2) *paraancora*
- (4) *Goniopora: djiboutiensis, lobata, stokesi, columna*
- *Lobophyllia corymbosa*
- *Physogyra lichtensteini*
- *Plerogyra sinuosa*
- *Ricordea yuma*
- (2) *Scolymia australis*
- (2) *Trachyphyllia geoffroyi*

FISH:

- *Ecsenius frontalis*
- *Nemateleotris decora*
- *Pseudanthias squamipinnis*
- *Pterapogon kauderni* (child from adults in the SPS tank)
- *Synchiropus splendidus*

In order to keep LPS healthy and happy, my advice to other hobbyists is to focus on a few things: clean water, gentle water flow, low to medium light, and feeding—remember also to dose amino acids and iodine. For me, my LPS tank makes this hobby such a joy, and it's fascinating to see how these corals like to eat and how they grow. It reinforces my belief that this hobby is the best one anyone can choose.

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Plectranthias pelicieri: ONE ASTONISHING PERCHLET

MINDY VAN LEUR

images by author except as noted

Meet Pablo! Pablo is a mature Pelicier's Perchlet, also known as *Plectranthias pelicieri*. I call "him" a "he," but "his" sex is not actually known. He is one of the smuggest fish I've ever kept. He's always perched somewhere looking down on his domain, curious and ever alert to findings of the food kind! He's a thick-bodied little guy with such intricate markings you'd wonder just what such a beautiful fish would be doing in the deep, dark waters of his natural habitat.

Pelicier's Perchlet belongs to the genus *Plectranthias*, which is closely related to *Anthias* species. This genus is home to a number of relatively small, extremely charming perchlets sure to warm your heart with their incredible characteristics. Pelicier's Perchlet naturally inhabits waters of 50 to 90 meters depth (164 to 295 feet), making it a rare find in the aquarium trade. Its maximum size is reported as 4.5 cm SL (1.77 inches), with SL meaning "standard length," or the length from the tip of its snout to the end of the last posterior vertebra. Most of the fish belonging to this genus are quite rare to very rare in the aquarium trade, and accordingly quite pricey. The exception is *Plectranthias inermis*, which is collected from shallower reef zones and usually referred to as the Geometric Pygmy Hawkfish (but is obviously not a hawkfish at all) or is

sometimes called the Hi-Fin Perchlet. These are fairly common in the trade and typically priced about the same as common *Anthias* species.

Apparently, Pablo is a big boy as he does exceed the maximum reported size for his species by quite a margin. He is approximately 2.4 inches SL and is right around 3 inches total length from the tip of his snout to the tip of his tail. Pelicier's Perchlet is reef-safe in the sense that it hasn't been reported to harm any corals, though small fish and invertebrates such as Peppermint Shrimp may become snacks. In my own tank, I have a Panamic Barnacle Blenny (*Acanthemblemaria hancocki*) named Streaker, who was there long before Pablo, and Pablo doesn't bother him. I do find it interesting to note that Streaker seems much more cautious about zipping out for food since Pablo was added. I also keep a large Cleaner Shrimp in the tank that Pablo takes no notice of. Even though Pablo has yet to munch on any other livestock in my reef, he does stand up to my Tomini Tang, Skipper, even though Skipper rules the roost.

A fellow reefer added a Yasha Goby during daylight hours to his small reef housing a Pelicier's Perchlet, and his perchlet quickly darted up and gulped down the startled Yasha Goby before anyone knew what was happening! So there is at least some risk in housing a Pelicier's Perchlet with small fish.

Acquiring a Pelicier's Perchlet in Canada was quite a challenge. Pablo was imported by a local fish store here from Quality Marine, along with a second specimen. Unfortunately, the second specimen perished in a tank crash, and I'm not aware of any other Pelicier's Perchlets in Canada, though there must be a few. When I received Pablo, he readily accepted frozen foods. Pablo now eats anything I put in the tank—he's not a fussy eater. I mainly feed my tank a homemade mash that he took to immediately, as well as a few meals a week of *Mysis* shrimp, clams on the half shell, and plankton. I also supplement with live Blackworms on occasion. Pablo pounces on and consumes all of these foods quickly. This fish is so charming that I could spend hours overfeeding my reef just to watch Pablo zip around and grab food. Pelicier's Perchlet has a funny way of swimming since its body is laterally compressed; it really wags its tail when it swims, and it looks like it takes so much effort. No wonder Pablo doesn't swim too often!

Even when Pablo isn't feeding, he's still quite the character. A quick scan of the tank will usually find him perched somewhere looking out. He has his favorite spots throughout the tank, and he makes his rounds all day long. Any time I add a new frag to the tank or adjust the rockwork, Pablo is quick to stop by and check out the renovations from a nearby perch, with one googly eye looking one direction and one googly eye looking another. Even though Pelicier's Perchlet is collected from deep waters (in scuba terms), Pablo has not had any issues acclimating to a brightly lit SPS tank. Most of his hangouts are in holes or caves in the rockwork, but I think that is more of a habitual thing rather than to actually avoid the light since he doesn't hesitate to come blasting out of his holes to check out something interesting.

Pelicier's Perchlet has the most brilliant markings! Take a look at these images of Pablo, and you will see his base coloration is a

Geometric Pygmy Hawkfish | Image by Colby Bay

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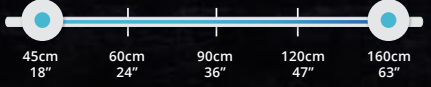

Red Sea

salmony-pinky-orangey-red. On his posterior are markings with stunning yellow-orange and white highlights. The yellow markings continue forward to the pectoral fins, morphing into vertical striping that fades out toward his front. His eyes move independently, and the black pupils are outlined in bold, iridescent yellow. His posterior is adorned with white vertical bars mainly above the lateral line that are strikingly similar to a sound graph. It doesn't stop there

either—all his fins are striped or spotted with red and/or yellow, set off with some iridescent blue! If you compare all these markings with other mature individuals, they are surprisingly very similar from one fish to the next, with the main variance being the white vertical barring.

Since Pelicier's Perchlet is probably out of the normal price range for the typical reef hobbyist, it is good news that there is another member of the *Plectranthias* genus that is affordable. Though the Geometric Pygmy Hawkfish, at only 2 inches, may be significantly smaller than Pelicier's Perchlet, its character and charm are nearly on par. Provided your reef is suitable for a smaller fish like this, the Geometric Pygmy Hawkfish may be a wonderful addition to your reef! If you feel like splurging, do consider Pelicier's Perchlet, as he will not disappoint!

Keep on reefing on!

not another BRINE SHRIMP article

JASON ONEPPO

images by author except as noted

I know what you're thinking. "Oh no, not another article on brine shrimp!" But bear with me; I promise to make this one interesting by revealing some little-known knowledge about the history of brine shrimp in our hobby. My earliest experiences with brine shrimp date back to my youth and my father's aquarium. I have fond memories of standing in a hot and humid fish room at the local fish store, surrounded by the sounds of bubbling corner filters and staring in awe at the tank full of live brine shrimp. My dad would request one portion from the fish room worker, and we would bring it home to feed to his aquarium. Although I found it fascinating to watch the shrimp swim around in their bag, I also enjoyed watching the fish chase and gobble them up.

Brine shrimp, also known as *Artemia* or Sea Monkeys, are the only aquarium fish food that have penetrated pop culture, achieving an almost iconic status. Brine shrimp were originally sold as kids' pets through colorful ads featuring whimsical and charming anthropomorphized characters in comic books. They have been featured on t-shirts and in cartoons such as *The Simpsons*, *South Park*, and *Family Guy*. In the 90s, they had their own TV show called *The Amazing Live Sea Monkeys* and appeared in feature films such as the Mike Cassidy cult classic *The Giant Brine Shrimp*. They even have a scene in the recent movie *The Secret Life of Pets* where they had a single line that says it all: "It's not our fault we don't look like the ad."

Sea Monkeys are a hybrid species created in a lab, and their scientific name is *Artemia NYOS*. Two different species of brine shrimp were chosen to create Sea Monkeys so that they would be hardy, they would hatch readily, and the eggs (cysts) had a long, stable shelf life that was not adversely affected by environmental conditions. I was fortunate enough to have had several conversations with marine biologist Dr. Anthony D'Agostino, one of the people responsible for making Sea Monkeys a reality.

References to brine shrimp can be found throughout history. Although they are not recommended for human consumption, I remember reading of indigenous hunter-gatherers making a soup from them that was considered a delicacy. Old

Brine shrimp aquaculture facility


Decapsulated brine shrimp eggs

English briners called brine shrimp "clearer-worms" because of their ability to clear the water and purify the salt by removing undesirable minerals. Brine shrimp aid wastewater treatment in a natural way; bacterial solids in salty wastewater are consumed by algae, which is in turn consumed by brine shrimp. In 1979, oil exploration crews were coring sediments around the Great Salt Lake and produced a sediment core that contained a layer of brine shrimp cysts packed between two layers of halite (salt). These cysts were sent to the University of Utah and were carbon dated at 10,000 years old. The university then proceeded to rehydrate and successfully hatch the cysts! Sierra College conducted preliminary in-orbit experiments aboard the space shuttle *Atlantis* during the flights of STS-37 and STS-43 where brine shrimp were used as a model system to assess microgravity effects on developing organisms.

WHAT ARE BRINE SHRIMP?

Brine shrimp species belong to the phylum Arthropoda, subphylum Crustacea, and they are members of the zooplankton community, like copepods. Their life cycle begins with the hatching of dormant cysts, which are essentially encased embryos. These cysts can remain dormant for many years, as long as they are kept dry, cool, and protected from UV radiation. When the cysts are placed into saltwater, they readily rehydrate, and the encased embryos hatch and continue their development.

Brine shrimp are cosmopolitan animals found wherever saline lakes and/or solar evaporation ponds are present. From mountain salt lakes in such wide-flung locales as Tibet and Utah, to pools in the Siberian tundra and the Chinese Gobi Desert, to temporary lakes in Iraq and South America, brine shrimp have colonized a wide variety of waters of different chemical composition. These include chloride, carbonate, sulfate, and potash lakes.

Brine shrimp are masters of osmoregulation and can therefore exist in high saline waters, which exert an enormous osmotic pressure on the creatures that live there. It is this particular capability that protects the otherwise unprotected brine shrimp from predators, which cannot live in waters of such high salinity. The lowest salinity in which brine shrimp are naturally found is approximately 70 to 80 ppt (slightly more than double the salinity of a reef aquarium). Brine shrimp are limited to the higher salinity ponds since some fish occur periodically in the lower salinity ponds.


Desert salt pond

Brine shrimp are continuous, non-selective filter feeders. They filter particles like micro-algae, bacteria, and detritus from the water using their feather-like appendages and transport these to a groove located on the belly of the animal.


30-hour-old nauplii


Male brine shrimp 100× magnification

Aerial view of salt ponds in the San Francisco Bay Area

Very fine hairs in this groove transport the food to the mouth where it is ingested.

As long as environmental parameters are favorable, sexually mature brine shrimp reproduce by means of brooding baby brine shrimp (nauplii) that hatch in the parent's uterus and are then released (live-bearing or ovoviviparous reproduction). The nauplii first consume their yolk reserves before they start feeding independently. In nature, it takes the nauplii about 3 weeks to reach adulthood. Every 3 to 4 days, an adult female can produce up to 300 nauplii. Brine shrimp live anywhere from 3 to 6 months in nature, depending on the species and circumstances. When environmental parameters are not favorable (e.g., temperatures or salinity too high or too low, or lack of food), female brine shrimp stop producing nauplii and start producing eggs that contain dormant embryos. A special gland in the uterus of the female coats each egg in a protective layer of chitin, and the egg is then released into the water. The eggs remain in the water until more optimal conditions are detected. This allows populations to survive during periods when all adults perish.

Brine shrimp are sexually dimorphic. The males have large claspers used for holding onto females to get busy—shrimp style. Females have no claspers, and they can often be observed with eggs.

THE DISCOVERY OF BRINE SHRIMP AS FISH FOOD

Live brine shrimp were first used as fish food in the early 1930s. The Steinhart Aquarium at the California Academy of Sciences discovered copious quantities of brine shrimp living in the solar evaporation ponds of Leslie Salt around San Francisco Bay. The San Francisco Aquarium Society promoted the use of brine shrimp as live food and consequently, the San Francisco Bay strain was the first strain of brine shrimp to be harvested as a live food for rearing marine and freshwater fish and crustaceans. They proved to be such an ideal aquarium fish food that the San Francisco Aquarium Society quickly promoted adult brine shrimp as a necessity in bringing aquarium fish to spawning condition and baby brine shrimp as a critical first living food for newly hatched fish fry.

BRINE SHRIMP EGGS

As discussed earlier, brine shrimp can give birth live or distribute eggs, depending on environmental factors. So if it's not all blue skies and sunshine, brine shrimp release eggs. It's an amazing experience to go to the ponds where brine shrimp live and see eggs all along the shore being harvested and then hauled back for processing in burlap sacks. I can assure you that anyone who has had the privilege of experiencing the smell of freshly harvested brine shrimp eggs will tell you it is not pleasant. It's not only the eggs that wind up being collected but also the mud and other debris that wash up on the shore with them. The eggs are then put through an intensive screening, washing, and drying process that separates them from this debris.

HATCHING BRINE SHRIMP

Freshly hatched brine shrimp are one of the best foods available for fish larvae, small fish, reef aquariums, and any other small aquatic organisms because they provide proteins and fatty acids, which accelerate growth and increase survival. A cone- or funnel-shaped container is by far the best design for a brine shrimp hatchery.

Sacks of freshly harvested brine shrimp eggs

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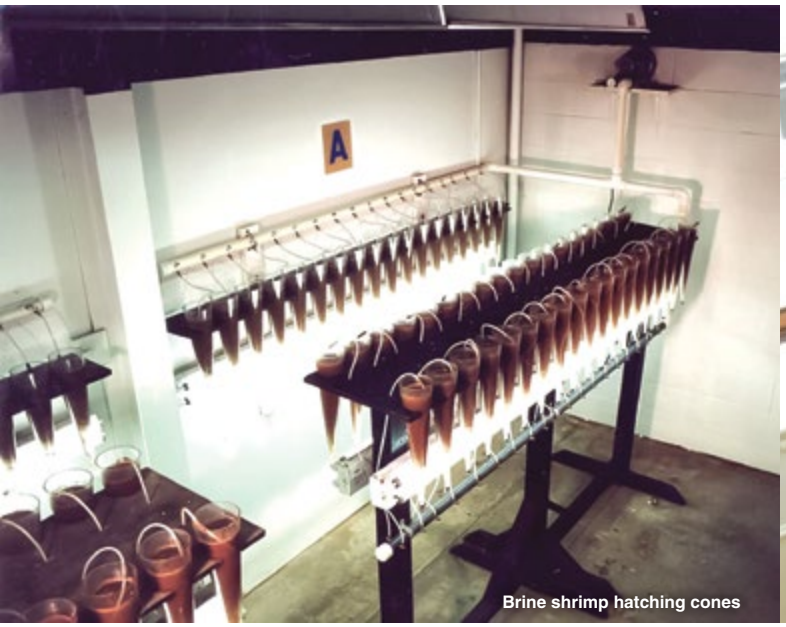
Nauplius and nauplius emerging from egg

Glass juice containers and other household containers may work, but they aren't nearly as convenient or as effective as the hatcheries available at your local fish store.

A basic formula that has worked repeatedly for me over the years is to use 1 liter of untreated tap water (don't worry if chlorine is present; it may help to dissolve the outer shell of the egg to aid in a more successful hatch), two tablespoons of rock salt (non-iodized salt), ¼ teaspoon of Epsom salt, and ¼ teaspoon of baking soda. The Epsom salt and baking soda will help to buffer the pH if you happen to have soft water. You can also use water from your reef tank. Place an airline so that it reaches the bottom of the hatch container and adjust the flow so you get a steady flow of bubbles that tumbles the eggs. If you turn the air up too high, eggs will stick to the top rim of the hatch container.

Hatch time is temperature dependent. If you are down around 70° F, it may take up to 36 hours for the eggs to hatch. If you are on the high end at 86° F, it may take only 11 to 14 hours. Be safe and hatch between 82° and 86° F. You can use an incandescent bulb in a desk lamp to help boost the temperature if necessary. I have also seen people use a water bath method.

When it's time to harvest the nauplii, first turn off the aeration.


Brine shrimp hatching cones


Brine shrimp grow-out tank | Image by Steve Geerts

Then turn off the lights in the room and use a flashlight or the light on your smart phone and aim it at the bottom of the hatch container. This will attract the nauplii and concentrate them into one area, leaving the empty cysts to float to the top. Use a pipette to suck up the nauplii, squirt them into a brine shrimp net, and rinse. Tap water is fine; it won't have a negative effect on your reef, but if you insist, you can use RO/DI.

GROWING OUT BRINE SHRIMP

Although not easy, baby brine shrimp can be reared to adult size in 3 weeks. If you are looking for a source of food for your fish, it is less expensive and time consuming to purchase live, frozen, or freeze-dried adult brine shrimp from your local fish store. Before reaching adulthood, brine shrimp go through 15 larval stages, which are

Brine shrimp holding tanks

called Instar 1 to Instar 15. The newly hatched baby brine shrimp are called Instar 1 nauplii. They do not need to be fed immediately since the nauplii live on their yolk reserves. After about 6 to 8 hours, the yolk sac is depleted, the mouth and anus of the nauplii have opened, and the animals can start feeding. At this time, however, mortalities can occur as bacteria start invading the nauplii through those same openings.

Because they feed continuously, food should be available at all times. Brine shrimp have very small mouths and cannot eat food bigger than 50 micrometers (1/500"). For foods, you can use some of the readily available products on the market, such as phytoplankton, algae paste, or Spirulina (tablets or powder). Another popular method is to add green water (phytoplankton) to provide a constant food source.

It is important to start with a clean, disinfected grow-out tank to limit the amount of bacteria present. A 10-gallon aquarium is ideal. The salinity should be kept between 28 ppt (1.021) and 40 ppt (1.030). The ideal pH is between 8 and 9. They can be reared at a temperature between 68° F and 86° F with a temperature of around 75° F being most suitable. The warmer the water, the quicker they grow, the more they eat, and the more they excrete. Higher temperatures will also make reproduction less productive and shorten the life span of the shrimp.

Aeration should be installed to keep the amount of dissolved oxygen at an appropriate level as well as to keep food items suspended in the water column. Be careful that the bubbles aren't too small since these can get stuck on the brine shrimp, hindering their ability to feed. Do not provide too much light as this might be counterproductive. Brine shrimp cultures are high in nutrients, so undesirable algae growth should be avoided. A few standard light bulbs are okay. High levels of ammonia and nitrite should be avoided as well. The easiest way to control this is through water changes. Siphon the water into a bucket through a brine shrimp net, replace discarded water, and immediately return any brine shrimp that have collected in the net to the grow-out tank.

Brine shrimp have been a staple in the hobby for over 75 years and have proven to be an invaluable food source for many fish life stages. They are available in many forms, including live, eggs, frozen, freeze-dried, flakes, and in concentrated liquid feeds. Freshly hatched brine shrimp are an ideal food for reef aquariums. The growing out of baby brine shrimp is both fun and educational, although not cost effective as a food source. So until next time, hold on to your seahorses, and as always, keep it real, fishes!

Female brine shrimp with eggs

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

PETER LALIC

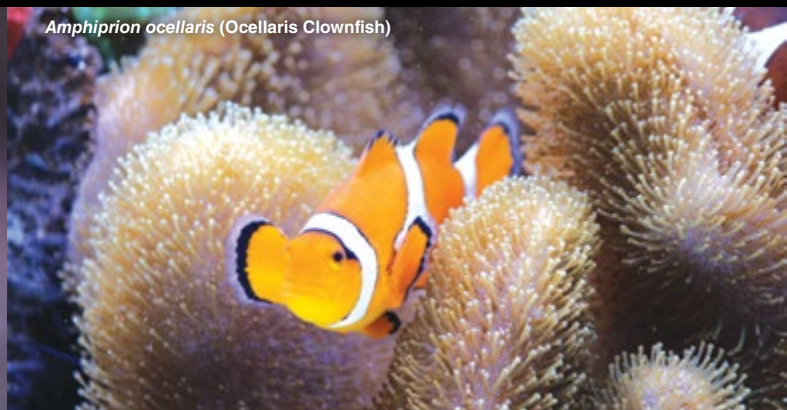
Serbian Reef Splendor

I grew up watching amazing shows on television about marine life and colorful reefs. For as long as I can remember, those shows always captivated me. I often dreamed about snorkeling in those distant, exotic locations that seemed so far away from every aspect of our lives.

Now, in the middle of the gray Balkan landscape, there is a household that radiates with the beautiful smells of the sea, with real living coral in a majestic glass box, inspiring all those who see it in person. For many of us, this is not just a hobby, and this article is dedicated to all of you out there who love and have a deep appreciation for the world of nature.

I had kept freshwater tanks for as long as I can remember and always enjoyed the fascinating underwater movement. Then one day, I met someone—who is now my best friend—and he had a beautiful reef tank, full of colorful corals and fishes. It seemed so difficult at first to imagine keeping all those interesting organisms

***Nemateleotris magnifica* (Firefish)**



***Amphiprion ocellaris* (Ocellaris Clownfish)**

Display, sump, and frag tanks

alive, but I wanted to try it myself with my 16-gallon tank. As a present, he gave me my first piece of live rock.

While watching and waiting for this glass box with live rock to cycle, I knew I was hooked for life. With only feather dusters, worms, and sponges, I felt like I didn't need anything else. I was very satisfied. After a month or so, when the nitrates dropped, I put in a pair of clownfish and a few species of soft corals. I was amazed that there was a real live reef in my house, right in front of my eyes!

Unfortunately, here in Serbia, we have only one store that imports and sells marine life and reef aquarium equipment. As people in my country started to build their own saltwater tanks, I converted my 100-gallon freshwater tank into a marine tank, along with three more 16-gallon frag tanks for education and experimentation. On one occasion, I acquired a fresh piece of live rock that had just arrived at our only reef store, the ReefRoom. I remember how happy I was that it came with a hitchhiking worm! Luckily, I was able to identify it as a Bobbit worm and quickly removed it from the tank. On another occasion, I got a hitchhiking sea hare, and I learned very quickly about all the blessings this animal would bring to my growing reef as it mowed down the nuisance algae. Having one store in the whole country is nice and interesting but limiting at the same time.

Currently, I enjoy lecturing at aqua fairs in my country, experimenting together with scientists around the world, and making great progress along with my fellow reefers from all parts of the globe. I am also blessed to have the opportunity to take part in aquarium equipment research and development on a professional level.

***Zebrasoma desjardinii* (Sailfin Tang)**

SYSTEM

My 100-gallon tank is 2 years old now, and it's had some ups and downs. This is mostly because I wanted to experiment with filtration, water flow, lighting, and everything else imaginable in order to learn in depth all that I wanted to know. I knew from the start that this would be my life and professional career. That's how addicted I was, and I still am.

Through all of my experimentation, one of the most important things that I learned was how to control various problems naturally. When a wand failed to fry all of my *Aiptasia*, I found success with an ugly-looking little filefish. When coral dip didn't kill nudibranchs feasting on my *Montipora*, I decided to give the job to a Yellow Coris Wrasse, who eliminated the problem and allowed the coral to return to good health. When *Sabellid* worms started to multiply in my reef, I added a Banded Coral Shrimp to control the problem. I also employed a Sailfin Tang to eat bubble algae; that fish even taught a *Paracanthurus* how to eat bubble algae! Whenever possible, I choose natural solutions for my problems instead of chemical alternatives. It has worked wonders for me.

Speaking of natural models, let's talk about my system in terms of trying to achieve a good natural environment for marine organisms. People tend to fight phosphates in different ways. I rely on the live sponges behind my rockwork. I keep these sponges well fed by not using filter socks and by having good random water flow. This random flow also increases the polyp extension of my corals. I like to keep the tank's environment as natural as possible.

In order for me to maintain good random flow, I use two Vortech MP40s programmed to "Tidal Swell" mode. I also use an Aqua Medic OceanProp 15000 in "Random Flow" mode from behind the rockwork at the base of my tank. Lastly, but most importantly, I am also using a Vertex Mocean 2000 for my return at the center of the tank. I keep it in "360 Rotating" mode so that clean water

Montipora capricornis

***Paracanthurus hepatus* (Blue Tang)**

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(10-190+ liters)
Wireless: Optional

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Tank Size: 50-500+ gallons
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Montipora digitata

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is distributed evenly all around my tank while also breaking up the linear flow from my circulation pumps.

LIGHTING

For my lighting, I am using a Vertex Illumina SR260 because I like to use LED chips without lenses. This eliminates any shimmer effect and gives an even distribution of light over my entire tank. Based on the findings of my dear friend Dana Riddle, with regard to PAR levels found off the coast of Kona, Hawaii, I keep my PAR levels lower than might be expected. I am pretty satisfied with the results, but if you wish to have more color, you can ramp up your PAR values more, and the corals will respond with more fluorescence. As for spectrum, I am using 25% blue, 25% royal blue, 50% cold white, and 20% green. Regarding PAR values, I am keeping my *Sarcophyton* at 120 µmol/m²/sec, *Montipora digitata* at 300–350 µmol/m²/sec, *Montipora capricornis* at 250–300 µmol/m²/sec, *Euphyllia* at 150 µmol/m²/sec, and *Discosoma* at 50 µmol/m²/sec.

FILTRATION

I am using a Vertex I-Supra C+ sump with a Vertex Alpha 250 skimmer. This sump is really easy to manage, and its design helps me keep all my cables covered and away from my working space. It also has great routing spaces for my dosing hoses, probes, and everything else. The Alpha 250 skimmer sounds like overkill, but let me explain that a little bit. As I said before, I am living in the Balkans,

and people here tend to smoke a lot. Really a lot, including me. I didn't want to have problems with low pH because of this, and I also didn't want to raise pH using kalk via top-off. I decided that I needed a lot of outside air pumped into my tank. I use the Alpha 250 monster skimmer to suck clean air from outside for skimming. I was able to fine tune this big skimmer to get just enough proteins out without removing all of the trace elements at the same time, all while pulling in a lot of clean outside air to help stabilize pH. You can also have higher pH if you keep your alkalinity higher, but I didn't want to do that because I like my polyp extension at natural alkalinity levels. My pH is 7.9 overnight and 8.2 during the day.

Other than my skimmer, I am not using anything else for filtration. The tank is well balanced. I am feeding a lot of flake food and frozen *Mysis* daily, and everything seems good for now.

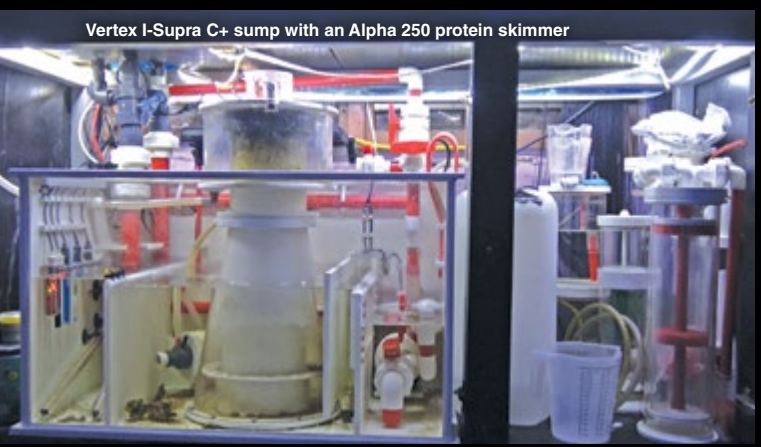
For heating, I am using a Jager 250 watt and a Jager 200 watt as a backup. For cooling, I have a few mini-fans in my sump, but I am thinking about adding a chiller in the near future for safety. It should also be less expensive than keeping my air conditioning on for the whole room when I am not around.

CONTROLLER

For my curious mind, I am using a Vertex Cerebra, and this provides a good display of all important values 24/7. It allows me to monitor pH, temperature, salinity (via conductivity), and ORP/redox. The controller performs a long list of other important tasks as well. It displays the power usage of my pumps, performs automatic top-off with RO/DI water, cleans the Vectra skimmer neck (every 4 hours), and controls the dosing pumps. It also shuts down my pumps during feeding and has a custom program for my water changes. For water changes, the controller is programmed to shut down the upper-positioned stream pumps but leave the lower-positioned stream pumps operational. This program also shuts off the return pump from my sump and ignores the level sensor status in my sump. These are timed functions that revert back to default status after 30 minutes.

DOSING

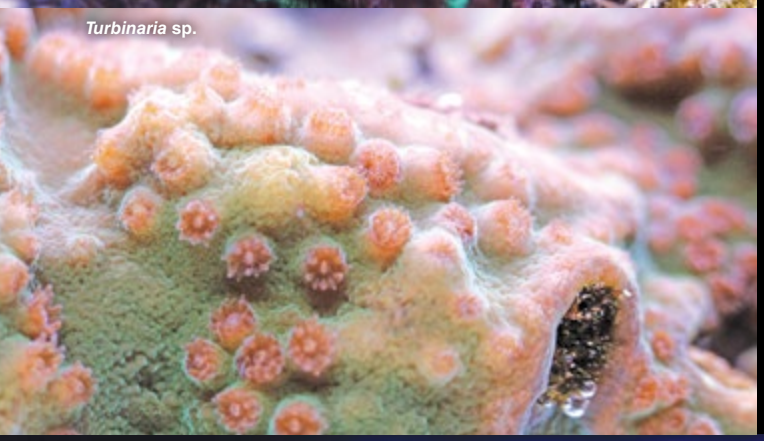
For dosing, I am using a Vertex Libra with three channels. I initially dosed carbonate, calcium, and magnesium from separate dosing



Vertex I-Supra C+ sump with an Alpha 250 protein skimmer

containers. Since I stopped using an algae scrubber, I don't need to keep up with magnesium as much anymore, and water changes take care of this element. This tank requires 280 ml of carbonate and 52 ml of calcium daily. For carbonate and calcium supplementation, I am using Fauna Marin's balling program with Ultra Trace Elements. I have also been using Fauna Marin's Color Elements for a few weeks now (8 ml per week).

***Favites pentagona* (War Coral)**



***Turbinaria* sp.**

CLEANING AND TESTING

I do 15% water changes every 2 weeks, and this is controlling the nutrients nicely. It could even be monthly, but I like to get my hands wet in my little reef.

I am testing for alkalinity and calcium once a week and for nitrates once a month. Testing for phosphates can be inaccurate with hobby kits, and I rely on my sponges to keep phosphates in check. But I still test for phosphates once every few months just in case. Keeping a testing/dosing journal with graphs of results over time is a really good habit to have. Many times, the perspective the journal provides has helped me to address and solve issues that appeared suddenly.

PARAMETERS

Salinity: 1.026 (35 ppt)
pH: 7.9 (night)–8.2 (day)
Temp: 80 (night)–81.5° F (day)
Alkalinity: 8 dKH
Calcium: 450 ppm
Magnesium: 1350–1400 ppm

LIVESTOCK

- *Acreichthys tomentosus*
- *Amblyeleotris guttata*
- (2) *Amphiprion ocellaris*
- *Fromia monilis*
- *Halichoeres chrysus*
- (2) *Labroides dimidiatus*
- *Lysmata debelius*
- (3) *Lysmata wurdemanni*
- (2) *Nemateleotris magnifica*
- *Paracanthurus hepatus*
- (2) *Pterapogon kauderni*
- *Salarias ramosus*
- *Tripneustes gratilla*
- *Zebrasoma desjardinii*

CORALS

Various SPS, LPS, *Gorgonia*, mushrooms, and *Sarcophyton*.

Our hobby is about having the patience to achieve a natural balance over time. We tend to live fast lives, but nature itself has a different and much slower time frame. This is why our tanks have such a calming effect on all of us. In a similar way, my journey in this hobby has been long and complicated, but ultimately very rewarding.

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BOXING SHRIMPS IN THE RING!

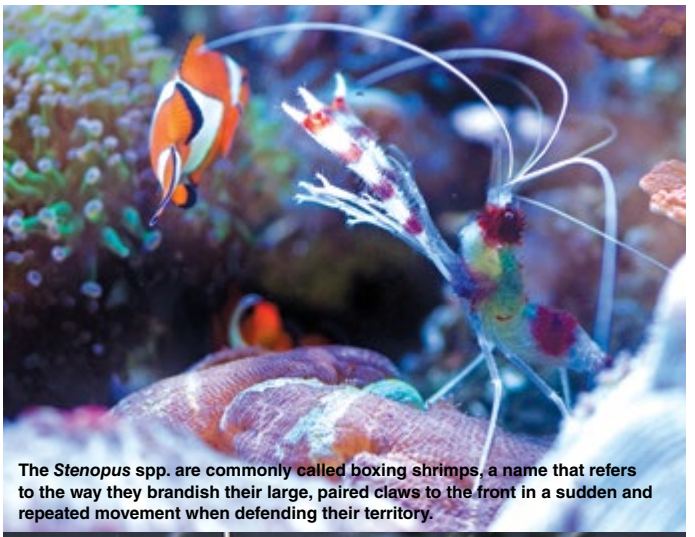
Historically, boxing shrimps (*Stenopus* spp.) were among the first shrimps imported by the marine aquarium trade. They remain a bestseller today because they are hardy animals in captivity and show some very attractive color patterns. The common name "boxing shrimp" refers to how they wield their large claws in response to a threat. Sometimes suspected of being dangerous to other animals in the aquarium, *Stenopus* can bring their undeniable charm to almost any tank if the shrimp species is chosen with attention to their needs and potential tankmates.

GENUS DESCRIPTION AND BIOLOGY

The *Stenopus* spp. are part of the Stenopodidea family, which includes, in addition to this iconic genus, the *Odontozona* and *Richardina* genera. These two never show up in the trade. *Richardina* spp. live in benthic areas located below 400 meters depth, and the *Odontozona* spp. are either cryptic, found at great depths, or both and remain invisible to commercial collectors. Another genus named *Juxtastenopus* was classified in 2010, representing only the *Juxtastenopus spinulatus* species, on which little information is available.

Crustaceans under the decapod order, the Stenopodidea have five pairs of limbs tied to the carapace (named pereiopods). But while most shrimp use three and sometimes four pairs of pereiopods for mobility, *Stenopus* and their Stenopodidea cousins dedicate only two pairs to movement; the three remaining pairs are modified into chela (pincers/claws). The front pair (hypertrophied) is used for defense, and the next two pairs up front are small chelipeds used for gripping food.

The genus name is composed of the word "Steno," the Greek root meaning "end" or "close," and "Podus," which means "foot." It



The *Stenopus* spp. are commonly called boxing shrimps, a name that refers to the way they brandish their large, paired claws to the front in a sudden and repeated movement when defending their territory.

The female is quite easy to recognize when her eggs are gathering in the ovaries, showing a greenish mass you can see through her cephalothorax.

accurately describes the long and slender limbs of the shrimps. The carapace and abdomen are also elongated and narrow. The shrimps look as if they're perched on high heels, and the fact that there are only two pairs of members associated with their mobility reinforces their flimsy look.

Their wingspan, from the tip of one large claw to the tip of the other, is often larger than the total body length of the animal. These defensive chelipeds are articulated into several segments. When the shrimp is at rest, these limbs remain folded in toward the carapace at a right angle. A view from above shows the *Stenopus* spp. forming a characteristic Greek letter Ψ (psi).

The Stenopodidea are gonochoric, which means that the sexes are separate, without any possibility of change. The mature female is larger and stockier than the male. Paired and monogamous, they mate in the juvenile stage (when the dimorphism is not discernable to us) and then live together until death. Due to the early formation of the pair bond, it is risky to try to match two individuals, even if they are clearly male and female. In captivity, two individuals of the same sex will fight to death, as the weakest can't retreat as it would in the wild. Only a mated pair tolerates each other in the aquarium, even in a large volume. Also, do not try not to mix different species together.

Once the pair bond is made, they rarely move separately, except when searching for food. Most of the time, they remain side by side, always in contact through their antennae. It is a fascinating spectacle and one of the characteristics that make these shrimps so desirable for hobbyists who like to watch natural animal behavior.

BREEDING AND REARING

One can spot a mature female by the greenish egg mass that can often be discerned within her semi-transparent carapace. Molts occur every 3 to 8 weeks, and the reproductive process takes place on the same schedule. The female receives the male gametes within 24 hours after molting, when the exoskeleton is still soft. She then lays the eggs. Like all other decapod crustaceans, females brood fertilized eggs under their abdomen. They are held firmly by the pleopods for 16 days of incubation and will hatch in the nighttime.

It is easy to get boxing shrimp to produce larvae in captivity. As with many other shrimps, start with a mated pair and a quiet tank

Note the specific neon blue color on the legs of most *Stenopus* shrimps. Biologists suspect that this is a color code recognized by potential clients that denotes a cleaner fish or shrimp. You can spot this color on some *Periclimenes* shrimps, juvenile angelfish, and cleaner wrasses.

with no predators, overflows, or propeller pumps. However, be forewarned that once the larvae hatch, rearing is difficult. First, you need to provide abundant and highly nutritious food for the larvae. There are nine successive larval stages before the larvae become juvenile shrimps. The larval stage is very long in the *Stenopus* genus (between 70 and 210[1] days depending on the species and husbandry conditions), and mortality during the transformation is high. Any dietary deficiency or bad water quality results in the death of many larvae during these crucial stages. Even if you succeed in meeting their diet and water quality requirements, success is not guaranteed. Young boxing shrimps tend to show very hostile behavior toward one another, reducing even further the number of survivors of the larval stages. As soon as the aggressiveness appears, one must quickly separate the larvae into individual compartment systems, such as PVC tube sections enclosed by some fine mesh net that allows constant water flow[2]. In consideration of these difficulties and the unprofitable side of the long larval stage, commercial breeding of boxing shrimp has not yet been developed.

ECOLOGY OF *STENOPUS* SPP. ON THE REEF AND IN THE AQUARIUM

Boxing shrimps are popular among the inhabitants of wild reefs for their zealous ability to clean parasites from fish, including larger species such as moray eels. Cryptic and secretive, the shrimps live in caves that usually host these large predators. Thus, they find their meal on their "client" without the necessity to roam the potentially hazardous open reef unprotected. In addition, as fish know them for their usefulness, they are spared by most potential predators. When the shrimps don't live with fish and need to seek clients, the *Stenopus* pair will remain under cover, only signaling their presence by displaying their very long white antennae (which are up to two and a half times the length of the shrimp) at the entrance to their cave. This undulating lateral sign, paced at a specific rhythm, is the universal sign for "cleaning" in the underwater world. Fish immediately recognize the signal, regardless of the animal providing the service—wrasses, small gobies, or other families of shrimp. Customers queue in front of the shrimp den, waiting their turn for a delightful delousing session.

In addition to the parasitic organisms taken from the bodies of fish, these shrimps feed on various benthic prey, including worms. This is a major asset in the reef aquarium, because a couple of *Stenopus* can effectively regulate an overabundant population of Polychaeta worms. Although these worms are quite welcome in the aquarium for their effective detritivore diet, overpopulation must be avoided as they can irritate other organisms with their stinging hairs and even kill clams and fleshy corals by nesting underneath. Like the spider crab (*Stenorhynchus* spp.), the boxing shrimps will feast on these worms. To witness a boxing shrimp holding a worm segment between its claws and chomping it slowly as if it was a baguette sandwich is a funny and unique reefer moment!

The downside of the species is that they also eat small snails in the aquarium, such as *Stomatella* and *Euplica*, or even bigger prey such as *Astraea* and *Turbo* snails. Even other ornamental shrimp can be eaten if you don't appease their great appetite! To keep them away from your grazer and detritivore team, simply feed them enough! They will eat all kinds of foods. Always keep in mind that crustaceans are animals with very big appetites, and if they do not find enough to eat with your feeding choices and schedule, they will take their pick among other organisms in the aquarium.

Some hobbyists have given a bad reputation to boxing shrimps, accusing them of killing other motile invertebrates in the aquarium

My other shrimps stay at a safe distance when the boxing shrimps are roaming the aquarium, knowing they have to fear these powerful tankmates. No harm is usually done, as everybody knows who the boss is.

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Todd Gardner

Todd Gardner is rapidly closing in on **#53** on a long list of marine species he has raised. This 2013 **MASNA** Aquarist of the Year is a professor of Marine Biology at Suffolk County Community College in Riverhead, NY. You may recognize his name from the numerous scientific and popular articles online about his research and experience collecting, keeping and culturing marine organisms. **AlgaGen** is proud to support Todd's ongoing efforts to raise those rare fish like the **Rainfordia Opercularis**. Keep an eye out for new and exciting breakthroughs to come!

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and even fish. But were they fed properly? We know that many hobbyists under-feed (sometimes badly) based on a fear of water pollution. Having always maintained *Stenopus* since my very first aquarium, I have never experienced any loss except some snails, which is somewhat inevitable when you leave home for many days and feeding is delayed. Several species of *Lysmata* shrimps have always lived in the same aquarium with my *Stenopus*, along with dwarf gobies and shrimp gobies, with no damage done. Obviously, these vulnerable animals do not approach the boxing shrimps' lair, and they move aside when the shrimps roam the aquarium.

The large, defensive claws have the capacity of autotomy. They break spontaneously when the shrimp is attacked by a predator, providing a diversion while the shrimp rushes to cover. They'll grow over again on the next molt, but smaller. It will take a second molt for the claw to regain its initial size.

To be sure my boxing shrimps eat enough, I give them a piece of frozen cocktail shrimp or a mussel once or twice a week. For a pair of *Stenopus hispidus*, I feed two small cocktail shrimps or one mussel. For smaller boxing shrimps, such as *S. cyanoscelis* or *S. tenuirostris,* half or a third of this amount is enough. This is a good complement to what they can find for themselves in the aquarium, and it avoids problems!

Stenopus have a cryptic and sedentary lifestyle, preferring to live at the entrance of a cave or under rock overhangs where they are often seen upside down. If they have to move out of their den, it will usually be at night. Their long, sensitive antennae then play an important role in perceiving the environment.

They like quiet areas of the reef and tend to be found in shallow water, between 2 and 5 meters, although they can be found at depths down to 200 meters.

FAMILY PORTRAITS: COMMON SPECIES AND RARITIES

Let's begin with the star of the boxing shrimps: *Stenopus hispidus,* or Banded Coral Shrimp. This is the most famous and earliest named species of the genus, first described in 1811. Widely distributed throughout the tropical oceans, most individuals found in stores are collected in Indonesia, the Philippines, or from the many collecting sites of the Caribbean Sea. This is a relatively large species; the female reaches about 2.75-inches long, with a wingspan of up to 4.7 inches. The male does not usually exceed 2 inches in length. With alternating red and white horizontal stripes on the entire body and on the large claws (hence the name Banded Shrimp), it is the largest, most active, and most fearless of the genus. Their behavior varies as individuals; some are so bold as to strongly chase a fish that comes too close to its lair, while others are more secretive and shy, leaving their lair only at night to scrounge for food. One thing is certain: *Stenopus hispidus*, like all others of its kind, will gain confidence if introduced as a couple and will become bolder over time. After a few years in the same environment, most specimens will show almost every day without fear, especially in the morning, evening, or when the hobbyist is distributing food. Eventually, they will be seen exploring the aquarium at ease, never far from a quick retreat but very much out in the open. Their cleaning behavior is not very often seen in captivity, except when kept with large fish.

Stenopus hispidus itself makes up at least 85% of boxing shrimp stock entering the marine aquaria market every year. Some less famous challengers, but still deserving to be known and cared for, are three beautiful species both smaller and far shyer than *S. hispidus*. *Stenopus cyanoscelis*, or the Yellow Banded Coral Shrimp, is about 1.5-inches long as an adult and comes from the Indo-Pacific. Its name refers to its carapace, which shows a beautiful bright-yellow color that is also present on the large claws. The other limbs are more or less bright blue. The posterior surface of the abdomen and the large claws show white and red stripes like *S. hispidus*. *Stenopus tenuirostris*, or the Blue Banded Coral Shrimp, is even smaller, with an adult body length of less than an inch.

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Photo Credit: Richard Back

Boyd Enterprises
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An image that leaves one speechless! The tiny *Stenopus tenuirostris* sometimes shares the burrow of the dreaded *Lysiosquillina*. Undoubtedly playing a cleaning role for the stomatopod, it is tolerated to the point where it can walk all over the mantis' body with confidence.
Image by Vincent Chalias

The carapace and the first segment of the defensive claws are bright electric blue, but the rest of the body has red and white alternating stripes. It is also native to the Indo-Pacific, and very surprisingly, it is sometimes found in a commensal relationship with a large mantis shrimp! *S. zanzibaricus*, or the Gold Banded Coral Shrimp, with an adult size measuring around 1.5-inches long, has a predominantly white color pattern, with only two red stripes on the abdomen and one on each big claw. The carapace is yellow, and it sports unique bright-red antennae. It is found in the Red Sea, the Indian Ocean, the western Pacific, and the African coast to Micronesia.

The comparatively rare *Stenopus scutellatus*, or Yellow Banded Coral Shrimp, originates from the Caribbean Sea. It is solid yellow with red and white stripes on the back of the abdomen and on its large claws. It measures about 1.5 to 1.6 inches as an adult.

AQUARIUM ENVIRONMENTS FOR BOXING SHRIMPS

Boxing shrimps are a great choice for novices or experts, whether you have a nano or a large tank. They are easy to maintain, readily available, and inexpensive. With a natural lifespan of 5 to 7 years, boxing shrimps are very interesting animals to observe.

With a nano aquarium, one can make a specific biotope for a mated pair of *Stenopus hispidus*. Kept by themselves, they will fearlessly roam the tank, unconcerned about predators. Do not keep small fish or shrimp of other families with them in tanks of less than 15 gallons, as territoriality and potential hunger could lead them to harm other animals. In a nano, you could keep a couple of small *Stenopus cyanoscelis*, *S. tenuirostris*, *S. zanzibaricus*, or any other small *Stenopus* species, if you're lucky enough to see them available someday. Want to get some lil' fishies in your *Stenopus* display? Move to a larger tank and add a few gobies from genera such as *Eviota*, *Trimma*, *Elacatinus*, *Gobiodon*, *Amblyeleotris*, or *Amblygobius*.

In bigger tanks, these smaller species would be barely visible, especially if the tank is filled with vigorous fish. A pair of *Stenopus hispidus* will make a good choice here, and they will show more and more as they get used to their environment. In large tanks, and especially when adding moray eels to the tank, a pair of *Stenopus hispidus* are a great addition, as there is a good chance that they'll return to their natural cleaning habits. Do not mix these shrimps with triggerfish and groupers, as with these gluttonous animals, the shrimps, even big and bold boxing shrimps, will be at risk in captivity.

In all cases and for all tank volumes, one must be sure to provide a suitable hiding place—a cave or shadowed overhang is preferable. It must be available before the introduction of the shrimp. The boxing shrimps will cause no harm whatsoever to corals and other sessile invertebrates as they are perfectly reef-safe.

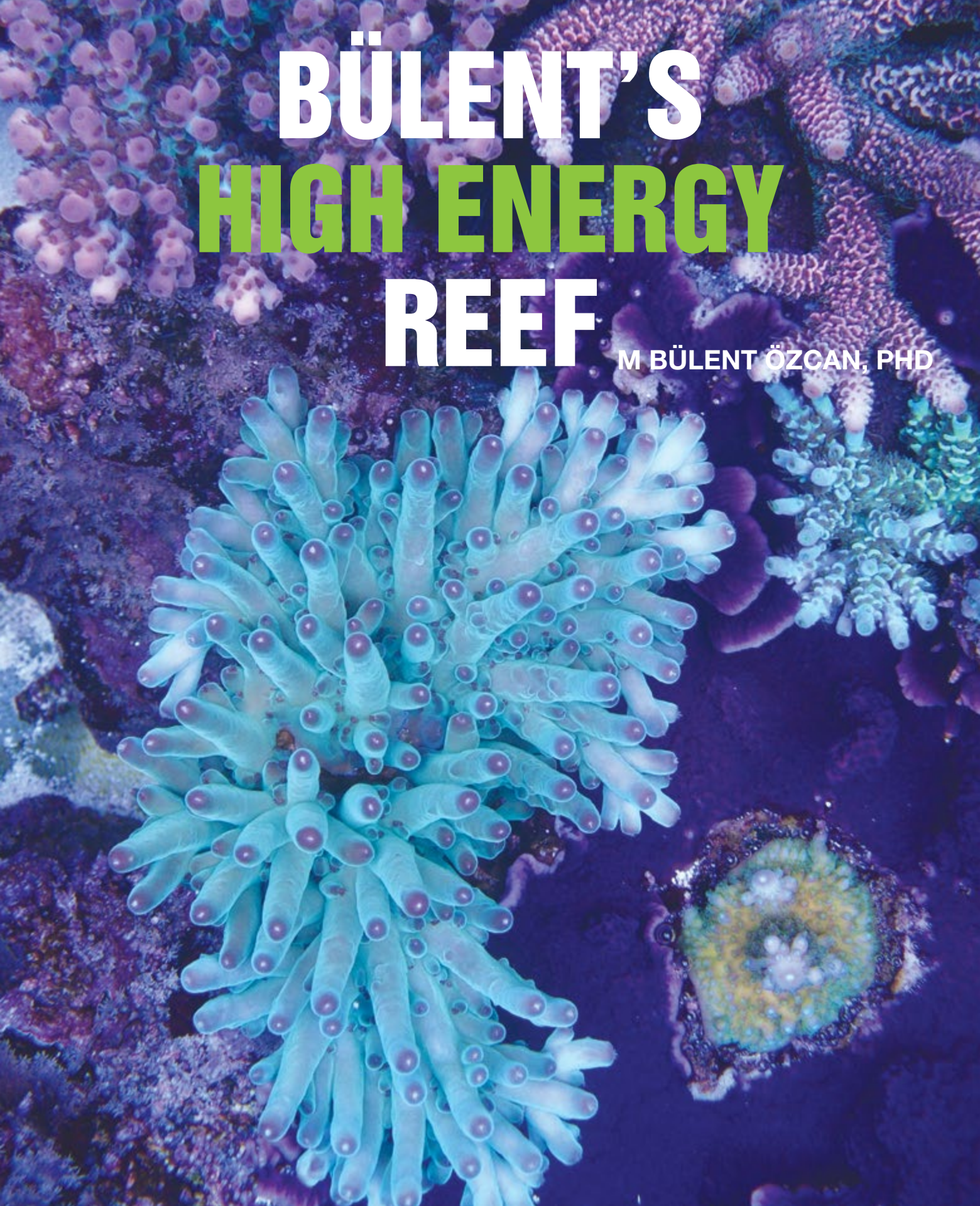
Special Notes (in the breeding/rearing part):

[1] Ornamental Marine Shrimp Aquaculture, Biology and Conservation (ABC), Junda Lin, FIT, Florida, 2005.

[2] Thanks to Alexandre Josso for aquaculture practical advice.

BÜLENT'S HIGH ENERGY REEF

M BÜLENT ÖZCAN, PHD

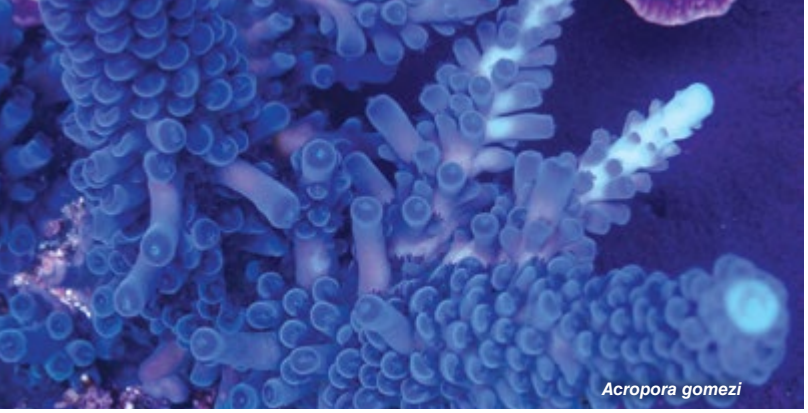


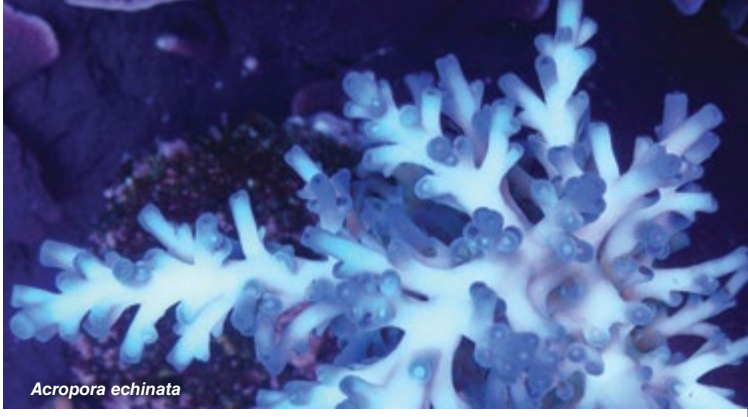
Full tank shot

My name is M Bülent Özcan, but in the world of reefkeeping, I am known as "discusheckel" (Reef Central) and "trout" (Ultimate Reef). I'm 51 years old and live in the U.K. I started my aquatic adventures at the age of 12 with guppies in a jam jar. I have kept goldfish, tropical fish, and eventually wild-caught Altum Angels and Heckel Discus. My adventure in reef aquarium keeping began nearly 8 years ago when I discovered the beauty of reef tanks while visiting a friend's house. He had a very large reef with soft corals. The movement and beauty of the corals, fish, and invertebrates I saw made a lasting impression on me.

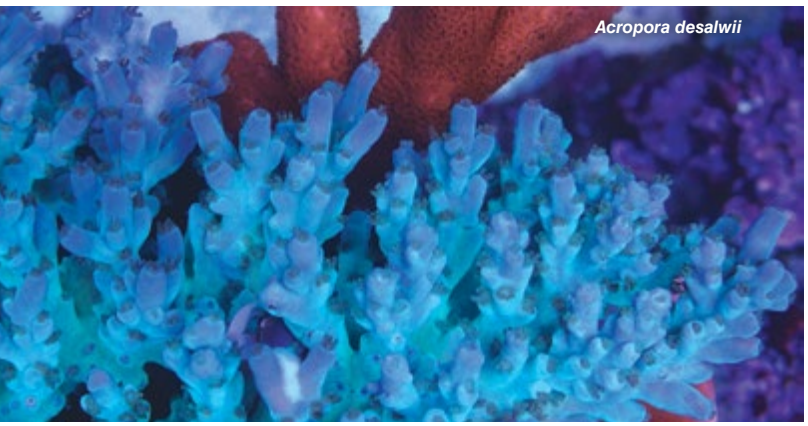
My first reef tank was a 24-gallon nano in which I initially kept a wild-collected Maroon Clownfish with some LPS corals. After countless modifications, I increased the fish population and started to keep SPS corals, but with only limited success.

I set up my current tank as a shallow mixed reef in order to be able to place my *Tridacna crocea* clams and Acroporids anywhere I wanted in the tank. Soon after it was set up, I realized that no matter where I placed my LPS corals, they were suffering under the intense illumination. This problem was compounded by an *Aiptasia* infestation. After trying many methods to eliminate this pest, I came to the conclusion that the only way to permanently address the problem was to get a filefish, which meant that all my LPS corals and Tridacnid clams had to be removed or risk being eaten. The only other alternative would have been to shut down the tank. This led to the beginning of my SPS-only tank.


Acropora gomezi


Acropora echinata


Acropora microclados


Acropora desalwii

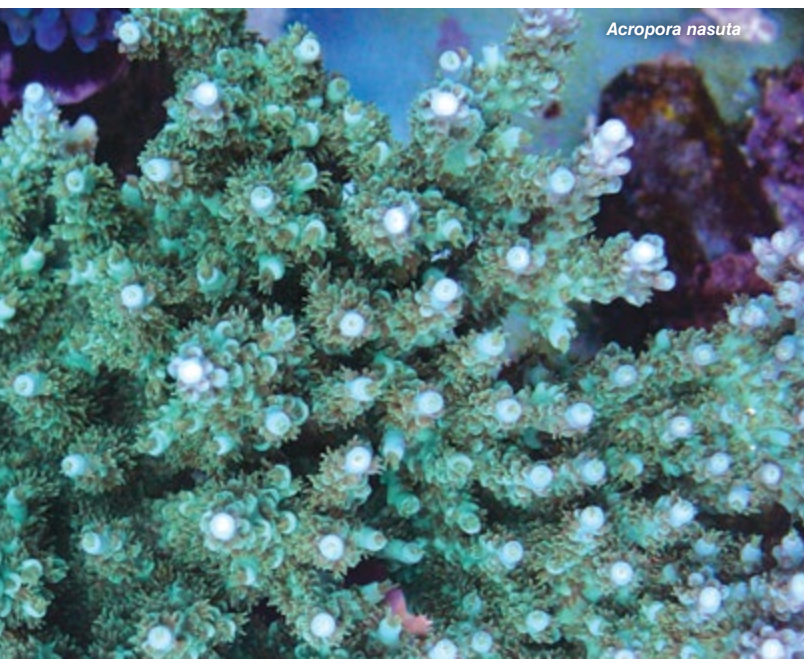
METHODOLOGY

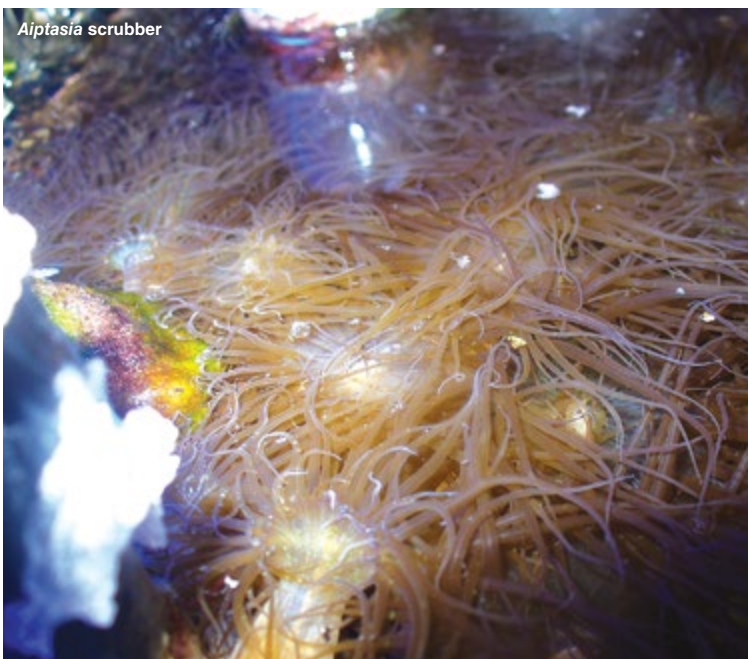
I keep a high energy SPS reef, which means natural reef temperatures of 27–28° C (80.6–82.4° F), high random flow (~80 times per hour), intensive light, and intensive feeding.

My primary method of maintaining alkalinity and calcium is to dose limewater (kalkwasser). I use a Deltec Kalkwasser Stirrer, which drips calcium hydroxide into the second chamber of my sump at a rate of 4 ml per minute over a 14-hour period daily. Due to the high stocking levels of stony corals, this does not meet all the alkalinity and calcium demand. Hence, I also employ Randy Holmes-Farley's two-part DIY dosing method (Recipe #2). When coralline algae growth increases, I additionally dose a magnesium chloride and magnesium sulfate mixture at a ratio of 10 to 1.

SYSTEM DETAILS

The display tank houses approximately 20 kg of live rock and four Tunze 6055 Nanostream pumps. I keep a 1-inch-deep Caribsea Fiji Pink sandbed. The internal overflow box inside the tank has two drains (one of which is essentially an emergency overflow) and one return pipe. The water level in the overflow box is controlled by a bulkhead under the tank. This box is also a safe refuge for dozens of mature *Aiptasia* that act as part of my clean-up crew. No uneaten food ever gets by them!


Acropora nasuta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Usage: Glue granules should be placed in hot water (about 60°C/ 140°F); after a few minutes easily forming mass will create, which has the best adhesive properties. The adhesive will become completely solid when placed in the aquarium. We recommend that gluing process is performed out of the water. Coral can be placed in the water 30 seconds after bonding. Unused mass can be used again. Biodegradable product.

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A fluidising reactor, intended for use with different types of filter media. It works perfectly as a reactor for Phosphate Absorbers, Activated Carbon and Zeolites. Thanks to the compact dimensions, it can be used both internally in the sump or externally. The Reactor is made entirely from high quality acrylic, making it resistant to damage and discolouration. We used a silicone seal which protects the filter against leakage. Inside the filter are sponges with a special fixture to prevent deformation of the internal sponge. We recommend the use of 3 Aquaforest Media, Zeo Mix, Carbon and Phosphate Minus in combination.

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The first chamber of my sump houses a Deltec skimmer and a Schego titanium heater. The second chamber houses 7.5 liters of Sera Siporax (15 mm) and some live rock. Siporax pieces are stacked up to maximize space efficiency and minimize detritus accumulation. The arrangement of baffles ensures that water enters and leaves this section from the top. This facilitates a uniform water flow over the Siporax media and very slow water flow further down the media, thereby creating optimal conditions for nitrifying bacteria. Furthermore, the live rock encourages sponge growth as well as supporting populations of pods and other zooplankton. The third chamber houses a return pump (which turns over the entire tank's water volume about six times per hour), additional live rock, 1 liter of Seachem Matrix media, and Seachem MatrixCarbon in a filter sock. I do not use any GFO (granular ferric oxide).

To optimize the growth and coloration of my corals, as well as the health of my fish, I use a strategy based on high nutrient input and output. I keep 16 fish in my setup. I feed them three to four cubes of frozen food several times a week and add large pieces of dry seaweed to their diet. I maintain nitrates between 2.5 and 5 ppm and phosphates between 0.024 and 0.046 mg/L. To maintain

Siporax box

nutrients at these levels, I rely on Tropic Marin's BIO-ACTIF control method and use a product called NP-Bacto-Balance, which contains organic phosphates, inorganic phosphates and nitrates, cationic trace elements (K+ elements), and mild organic carbon. While both nitrates and phosphates are reduced at a ratio, some are maintained to ensure that the corals do not starve. This is in contrast to traditional carbon dosing methodologies whereby nitrates are lowered rapidly and phosphates start to rise sooner or later due to nitrogen limitation.

Moreover, to help with biological and chemical processes, I dose Tropic Marin's A-Elements (anionic elements) as well as KZ Sponge Power. Both NP-Bacto-Balance and KZ Sponge Power encourage strong sponge, barnacle, and feather duster growth, which ultimately helps with breaking down organics.


Anthias swimming in the staghorn colony

LIGHTING

I have always used non-dimmable T5 technology to illuminate my reef tanks. I am a big fan of ATI tubes, in particular Blue+ and Coral+. I currently use a single non-dimmable ATI Powermodule with eight 39-watt tubes. The fixture covers almost the entire width of my tank back to front. This means that I can keep SPS anywhere in the tank without difficulty. I use three ATI Blue+, two ATI Coral+, one ATI Purple+, one ATI Aqua Blue Special, and one ATI Actinic. This combination gives a nice crisp white look with a hint of blue. Importantly, both reflective and fluorescent coral pigments look great. In order to run the T5 tubes most efficiently, I installed my tubes in such a way that their labeled ends (i.e., cooling points) are directly beneath the cooling holes on the Powermodule, and the fixture's three cooling fans are set to maximum cooling. This ensures that ambient temperatures over the cooling points are approximately 35° C. The Powermodule runs for 10 hours on full power and 2 hours at lower power to simulate dawn and dusk, so 12 hours in total. I use the ATI Blue+ and ATI Actinic combination for the whole light cycle, and I adjusted the unit's height above the tank so that my

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- Blue Daylight
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corals are exposed to PAR levels between 250–550 µmol/m^2/sec. My tubes get replaced every 10 months.

SYSTEM PROFILE

Display: 40 in × 21 in × 18 in
Display Volume: 58 gallons
Sump: 32 in × 15 in × 16 in
Sump Volume: 20 gallons
Overall Net Volume After Displacement: ~65 gallons

EQUIPMENT

Skimmer: Deltec SC 1350
Lights: ATI Powermodule (8 × 39 watt)
Pumps: (4) Tunze 6055
Top-Off: Tunze Osmolator Universal 3155
Heater: Schego 300 watt titanium with ATC 300 controller
RO Unit: D-D RO 50-gallon unit (4 stage with DI resin)
Chiller/Cooler: 4-way Azoo fan and Habistat Cool Control
Kalkwasser Stirrer: Deltec KM500
Dosing Pump: (2) Williamson 2 ml/min peristaltic pump

WATER PARAMETERS

Temperature: 27–28° C (80.6–82.4° F)
pH: not measured
Salinity: 34.5–35 ppt
Ammonia: not measured
Nitrite: not measured
Nitrate: 2.5–5 ppm
Phosphate: 0.024–0.046 mg/L
Calcium: 390–415 ppm
Carbonate Hardness: 6.45–7.65 dKH
Magnesium: 1255–1360 ppm
Potassium: 400–420 ppm

FISH

- Bellus Angelfish (*Genicanthus bellus*)
- Lamarck's Angelfish (*Genicanthus lamarck*)
- Masked Swallowtail Angelfish (*Genicanthus semifasciatus*)
- Matted Filefish (*Acreichthys tomentosus*)
- (8) Resplendent Anthias (*Pseudanthias pulcherrimus*)
- Royal Gramma (*Gramma loreto*)
- Silver Belly Wrasse (*Halichoeres leucoxanthus*)
- Swallowtail Angelfish (*Genicanthus melanospilos*)
- Yellow Tang (*Zebrasoma flavescens*)

INVERTEBRATES

- (3) Black hermit crab (*Calcinus laevimanus*)
- (4) Coral crab (*Tetralia* and *Quadrella* spp.)
- Giant feather duster worm (*Sabellastarte* sp.)
- (3) Hard tube coco worms (*Protula bispiralis*)
- (5) Mexican turbo snails (*Turbo fluctuosa*)
- (3) Orange-lipped conch (*Strombus luhuanus*)
- (3) Scarlet reef hermit crab (*Paguristes cadenati*)
- (5) Short-spined brittle star (*Ophioderma* sp.)

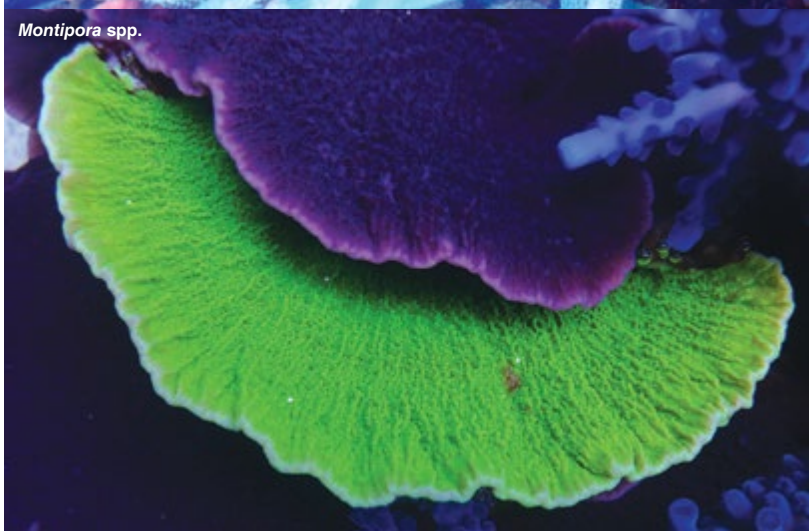
CORALS

- *Acropora aspera*
- *Acropora carduus*
- *Acropora desalwii*
- *Acropora echinata*
- *Acropora gomezi*
- *Acropora granulosa*
- *Acropora humilis*
- *Acropora lokani*
- *Acropora microclados*
- *Acropora millepora*
- *Acropora nasuta*
- *Acropora sarmentosa*
- *Acropora tenuis*
- *Acropora yongei*
- *Montipora capricornis*
- *Montipora digitata*
- *Montipora monasteriata*
- *Montipora setosa*

ACKNOWLEDGMENTS

I want to express my gratitude to *Reef Hobbyist Magazine* for giving me the opportunity to share my tank. I am indebted to my family—Katharine, Lewis Levent, and Daniel Hakan—for all their love and support. Thank you to my son Daniel Hakan and my next door neighbor, Ronald, for looking after my tank whenever I am away from home. Thank you to my fellow reefers on Reef Central. I learn a great deal from them. They are obsessed with coloration of *Acropora*, and it is often a depressing affair to compare the coloration of my corals to theirs, but one needs a challenge. I would like to thank them for their encouragement and sharing their wisdom with me.


Top-of-the-tank view at low tide


Montipora spp.

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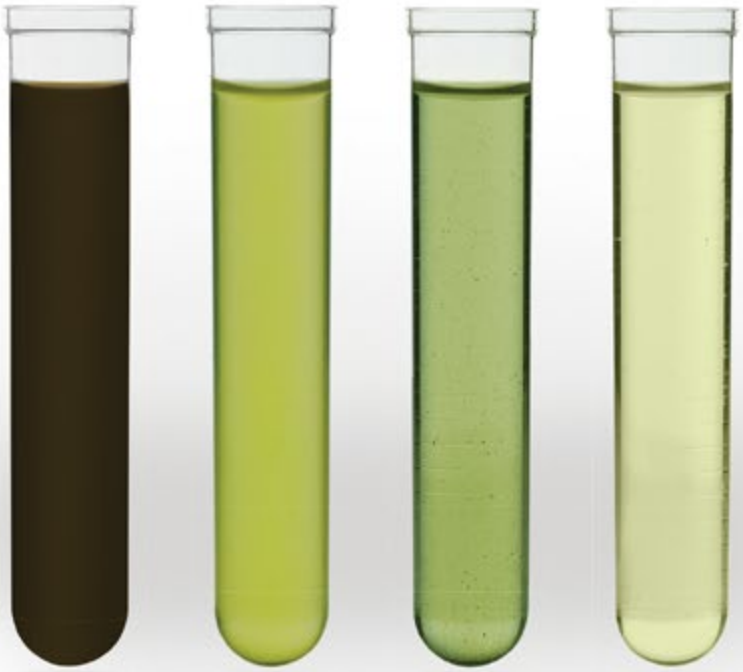

Product:	**Phyto-Feast** Concentrate	**Brand 1** Live Algae	**Brand 2** Live Algae	**Brand 3** Live Algae
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Grams of algae per bottle[2]:	**42.18**	2.17	1.04	0.79
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1) *Pavlova, Isochrysis, Thalassiosira weissflogii, Tetraselmis, Nannochloropsis,* and *Synechococcus.*
2) Wet weight; algae separated by centrifugation. 3) Based on retail pricing.

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