The Sea Star

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Inside this Issue

Welcome New Members

Steve Grammer

Mike Morrison

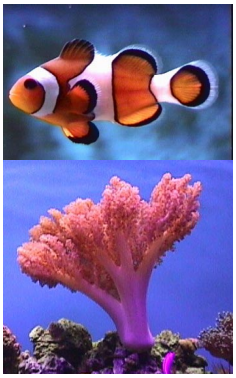
Weston Saunders

Richard Davis

Frankie and Dan Cheel

2001 Reef Tour - Sept 15th

The WMAS will once again end the summer with a bang; the 2001 Reef Tour promises to be the best one yet! Volunteers from all over the Wasatch Front will put reefs in private homes and businesses on display to the public on September 15th. We welcome anyone who wants to add their reef to the tour. Remember, the reef tour is not just to showcase large, spectacular aquaria – we want to encourage people to grow their own reef! Seeing reef aquaria that are smaller, newer, or "do it yourself" type systems can help others see that they too, can have their own reef.



The event will be Saturday, September 15th, from 9:00 AM to 4:00 PM. The self-guided tour costs only $5.00 per person/group (free to WMAS members, pet store owners, and their families).

Kick-off party Friday, September 14th

Bonneville SEABASE

We will kick off the sixth annual Reef Tour events Friday evening, September 14th, with a barbecue at Bonneville Seabase, near Tooele, where warm-springs-fed saltwater ponds are the home to spectacular tropical fish. WMAS members, pet store owners and employees, and their families are invited. Please RSVP to Mark Peterson. Seabase is a great spot for snorkeling and diving, where you can see the fish up close in a near-natural environment. Visit www.seabase.net for more information about Seabase.

Julian Sprung visit – September 15th

Julian Sprung, world-renowned reef aquarium expert and co-author of the highly touted series *The Reef Aquarium* will will speak at the Huntsman Cancer Institute auditorium on Saturday evening at 6:00 PM. Julian's books will be on sale that night at wholesale cost courtesy of Steve Larson of Independent Pet Wholesalers.

Scales & Tails Saturday Sept. 22nd

Scales & Tails

The Living Planet Aquarium's Third Annual Scales & Tails Dinner and Auction Gala. Saturday, September 22, at the Hilton Salt Lake City Center. Black-Tie optional. Tickets are $100 each. Call The Living Planet at 801-355-FISH for sponsorship opportunities and to donate items for the auction.

Recent Club Events

During our June meeting, Randy Olsen shared some of his knowledge and experience. His company, Mountain Shadows Marine (www.msmaquatics.com) which he calls a "high-end" marine aquarium business maintains some of the best marine aquariums in the state. His entertaining and informal style was a big hit with the club, and many have asked if Randy could visit us again - we certainly hope so!

Randy Olsen sits in front of two huge saltwater mixing tanks at Mountain Shadows Marine.

Some of Randy's stories involve his never-ending battle to "idiot-proof" aquariums that he maintains. One experience involved someone actually turning all the aquarium equipment off for a number of days before calling Randy to report that "it don't look right." Following Randy's comments, we propagated the hardy Wood's polyps (anthelia glauca). Mark Peterson has offered frags of Woods Polyps to anyone who didn't make it to the meeting.

Anthelia Glauca, Woods polyps

In July, we held our annual barbecue at Seabase. The food, prepared by Tim and Danh, was outstanding. Besides the snorkeling and diving, the club had the chance to watch the nurse shark feeding. We will visit Seabase again September 14th in conjuction with our Reef Tour kick-off.

Our August meeting was an interesting one as well. We started off with question and answer within the group, and we discussed the upcoming Reef Tour, including promotion and planning. We propagated three acropora (using the common superglue method) including the infamous "green slimer". Originally in Tim Weidauer's aquarium, the green slimer was propagated to several member's aquariums. Tim's original specimen, which grew so prolifically it was somewhat problematic, died following the crash of a large cladiella soft coral. This illustrates the benefit of trading coral – even if the original colony succumbs to some accident or natural death, fragments of the original colony remain healthy in other aquariums and can continue to be propagated!

Coral Propagation Update

In the June issue of the Sea Star, I shared the progress of a sarcophyton leather coral that we propagated in the April meeting. I'm happy to report that this coral continues to grow well, and you can see the updated photo below. The stalk has developed fully and the small juvenile now fully resembles a full-grown specimen.

Sarcophyton frag on June 1st and on August 1st.

During the August meeting, I became the proud recipient of a piece of the "green slimer" acropora. The picture shows the frag in its new home. I'll keep you updated on Slimey's progress over the next few months.

Slimey the acropora frag sits quietly in her new home.

Demystifying calcium and alkalinity

Since setting up my web site I have received thirty emails per week with questions about my reef or reefkeeping in general - about half of these are in some way related to the calcium and alkalinity balance. Every reefkeeper should have an understanding of the relationship between calcium, alkalinity, and pH, but not every reefkeeper has a chemistry degree (me either!) – so I will explain the basics that we all should know without getting too technical.

First, there seems to be a misunderstanding that calcium levels, usually measured by hobbyists in ppm or parts-per-million, and alkalinity, usually measured in dKH or degrees of carbonate hardness are completely independent. They are not. They work together in a continuous way, and each affects the other.

So let's start at the beginning – what exactly are these two metrics and what do they mean? Calcium levels are fairly simple – the concentration of calcium ions in the aquarium water. Seawater has a concentration of around 400ppm calcium.

Alkalinity is a bit more confusing because we aquarists get sloppy with our wording. Many people think high alkalinity means high pH. This is not true. A good definition of seawater alkalinity is the measure of its ability to resist changes in its pH. In saltwater, the carbonate and bicarbonates in the water buffer the system against pH changes – thus we measure the alkalinity, or ability to resist pH changes in our aquariums, by measuring the concentration of carbonate/bicarbonate in our water.

Increasing our alkalinity does NOT necessarily increase the pH, but rather, it increases the ability of the water to resist changes in pH.

Alkalinity affects pH in an indirect way – the life in our reefs produces organic acids that tend to lower the pH of our water. Increased alkalinity buffers the water against those changes, preventing the pH from continually dropping.

At the same time, much of the life in our reef is coral, coralline algae, and other things which tend to want to grow if conditions are right. For the above mentioned life, growth means laying down a skeleton of calcium carbonate. Where does that material come from? You guessed it, from your water.

Corals take the calcium, and the carbonate, that are in the water and combine them into the solid calcium carbonate. This means that a healthy aquarium needs to have both calcium and carbonate replaced or they will be depleted to levels at which coral cannot be healthy.

You should understand that this relationship is an equilibrium reaction. This means it will go back and forth as it gets influenced by other conditions, mostly pH. In other words, calcium carbonate will dissolve into calcium ions and carbonate ions, and the ions will combine again to calcium carbonate, back and forth. So how do you know which direction the reaction is going?

Simple – at a given pH value, there is a certain point at which the water is saturated (meaning it

Maintaining calcium and alkalinity levels is key - this acropora growth sequence occurred over 6 months.

can't hold any more) with calcium ions and carbonate ions, and the system wants to get rid of them by forming calcium carbonate solid. As the pH drops, the system can hold more, shifting the equilibrium reaction. This is why calcium reactors work; the added CO2 drops the pH enough that the reaction shifts and the calcium carbonate dissolves in the reactor. In the higher pH of the aquarium, the water is then saturated. Under saturation conditions, calcium carbonate will slowly form on its own, usually coating any solid surface. In extreme super-saturation conditions, calcium carbonate can spontaneously precipitate in the water as flakes, causing the phenomenon known as "marine snow". In an aquarium with healthy saturation conditions, you will get calcium carbonate deposits on pipes, pumps, etc. over time, so these must be cleaned out periodically. It is much easier for coral to grow, laying down calcium carbonate skeleton, under saturation conditions. Natural seawater is always saturated with calcium and carbonate ions.

If the system is at anything less than saturation point, the reaction goes the other way, and any calcium carbonate solids will slowly dissolve. This includes sand substrate, live rock structures, coralline algae, and even coral skeleton. Thus, it becomes much more difficult for coral to grow and thrive!

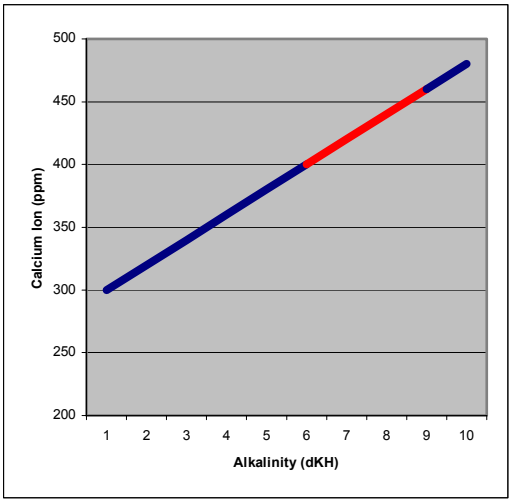
Obviously, we want to keep our aquariums at saturation levels for calcium and carbonate. To do this, we have to add calcium and carbonate back into the system, and add at least as much as is consumed by the reef. Furthermore, since the reef life consumes *both* calcium and alkalinity (carbonates) we have to add them back in the correct ratio, or over time they become imbalanced.

So, back to calcium and alkalinity. Many times aquarists hear that they should have calcium levels of at least 400ppm, and so they add calcium additives to maintain the 400ppm while forgetting the alkalinity. This leaves corals with lots of free calcium ions, but little carbonates, certainly below saturation, and thus the coral struggles. The aquarist dumps still more calcium additives (such as calcium chloride), trying to maintain even higher calcium levels to help the coral and clams grow better - all to no avail. The opposite can be true as well. Aquarists often dump "buffer" into their tanks because the pH is lower than they wish. The buffer increases the ability of the water to resist pH changes, but does not *directly* raise the pH. And, it increases the carbonates available in the system while doing nothing for calcium. Again the system gets into an imbalanced state and the reef suffers.

Get balanced!

So, the first step for any reefkeeper is to measure both calcium and alkalinity, and ensure these levels are balanced relative to each other. Once balanced, the calcium ions and carbonate ions are present in the same ratios as in seawater, and are usable for calcification (building coral skeleton for example). Then the aquarist must add calcium and carbonates in the same ratio as they are consumed, and preferably without adding a bunch of residual junk at the same time, as is present in some products on the market.

The chart below shows a line along which the calcium and carbonate ion concentrations are in the same balance as seawater. Remember, seawater has around 420ppm calcium and about 7 dKH of alkalinity.



As calcification occurs, the values shift along the line to the left. Many people keep reefs successfully without being exactly on the line, but are generally close to it. Many experts

advocate keeping alkalinity higher than natural seawater since aquariums are more susceptible to pH changes, and the higher alkalinity helps to reduce the fluctuations. Generally 7-10 dKH with 420 ppm calcium is a good target zone. If you find that your aquarium is NOT somewhere close to the line, you can add buffer to increase alkalinity without increasing the calcium levels, or calcium chloride to increase the calcium levels without raising alkalinity. Once you achieve a point somewhere on or near the line, you should only add calcium and alkalinity together so you don't upset the balance again.

To properly add calcium and alkalinity together in the correct ratios, you generally do one of the following: 1) perform water changes to restore the levels, 2) add two-part solutions such as B-Ionic, 3) use a calcium reactor, or 4) add kalkwasser. Each of these methods adds calcium and carbonate in the correct ratios without other residuals that will build up and upset your water chemistry. Each method has advantages and disadvantages, but a discussion of these is beyond the scope of this article.

This fox coral is happy as can be in Jim Perry's well-lit aquarium!

Once you are on or close to the line, strive to keep the levels somewhere in the red zone – at saturation. The exact saturation point depends on your pH, but if you are staying in the red zone you should be fine. This provides levels high enough to have good growth and keep your corals happy! Don't worry, if your system is balanced and you are adding calcium and alkalinity together in one of the 4 ways I listed, its impossible to drive the levels too high for your coral. Remember, once saturation is reached, the calcium carbonate will begin to form on all the solid surfaces, so once you are saturated, pushing levels higher means you will only cause faster buildup on your pipes and pumps!

So now you have it – no more confusion about calcium and alkalinity - now go saturate your reef!

Top-10 keys to a successful reef

Adam Blundell

This article is an adaptation from a lecture series created by Adam Blundell. The lecture series is used as presentations for public aquariums, environmental groups, aquarium clubs, and hobbyists.

Here it is – straight from the home office, just what you have all been waiting for: The Top Ten list. Located here in my hand, on a little blue card; the answer to all your aquarium problems: the top ten things you need to make your aquarium look like a million bucks.

#10 - a million bucks. Well, perhaps this is overstating, but the point is this - you can't expect your aquarium to be as large, dramatic, and fully stocked as an aquarium costing thousands more. Even tiny, inexpensive reefs are beautiful if cared for – know your budget and make the most of it! If you have a million bucks, go for it!

#9 - an understanding family. It may sound silly, but anyone who has been in this hobby for a while can tell you it is a significant commitment. The money, time, and life-altering processes that we call a hobby are very difficult to understand. It is difficult to enjoy a hobby that causes conflict at home! Know the limits of your family's patience, and operate within those limits! Share with others, and perhaps they will catch the vision! Remember, behind every expert out there, are ten people who helped him or her to continue their desires to learn more.

#8 - a second, separate aquarium. I can't even begin to describe the benefits of having a second aquarium. I recommend a fish-only, "reef based" tank as a second tank. These tanks can be very helpful for quarantine, acclimation, and housing fish that are not reef safe. These tanks can also serve as possible hospital tanks and as cheap and

easy display tanks. My prediction is that separate tanks to culture live rock will become ever so popular, as well as separate tanks to grow macro algae and invertebrates. No matter what happens, a separate tank is always a handy good idea.

#7 – proper lighting. Here is the rule of thumb for lighting: the more light the better. Can you over-do lighting? Not that I have ever seen. Think about this, how long would you have to sit in front of your aquarium to get sunburn? How long would you have to sit on the beach in a tropical area to receive sunburn? Research shows that even the brightest-lit reef tanks have only a fraction of the light available at midday on the reef. Trust me, there is a lot of light on the reef. The basic rule is to use the most light you can get. Its better to have a smaller, well-lit tank than a large tank where everything withers away. What about sunlight? I think this is the best light you can use, and it is also free! There is no artificial light source ever created that can match the power of sunlight. Sunlight is the universe's greatest energy source. Use it! Even if sunlight is used, many people still recommend that you use additional lighting, especially in the blue range. This is important because daylight is a whitish-yellow light, while the light that reaches coral in the wild is filtered by ocean water to a much more blue color.

A beautiful aquarium is the reward of the dedicated and patient hobbyist

#6 - Substrate. While many tanks are successful with the Berlin method, glass bottom method, shallow sand, mud, underflow, and more, I recommend a sand substrate. The type of sand and methodology is highly debated in the aquarium world. My recommendation is that you should make the sand and method match the style of aquarium you wish to have. I recommend a fairly deep sand band (~3inches) because it allows for a great waste storage as well as a great area for micro invertebrate life to flourish. If you have burrowing fish (such as many wrasse species) the sand allows for a safe hideout. I also like to grow plants and algae that use the deep sand bed for anchoring and rooting.

#5- Nutrition. How would you like to eat spaghetti for breakfast, lunch and dinner? How about everyday for the rest of your life? Why should we expect our fish and corals to thrive from one food source? Use a varied meal plan for your aquarium. For fish, I recommend a food cleverly called "Adam Food". This is my attempt to make a well-balanced food source that feeds all of your tank inhabitants. Buy several kinds of frozen foods, and mix them all together to make this food. I also like to feed with leafy green vegetation. Romaine lettuce is always a debate, but I am a big fan of Romaine for aquarium fish. Whatever foods you chose to use, just remember to mix it up and keep it healthy.

#4 - Live Rock. This is my secret for curing typical fish problems. While live rock is an understood necessity in aquariums with corals, it is often considered optional for the tanks that are fish only. The benefits of live rock "reef based" tanks greatly outweigh the disadvantages. While there is a big debate about which method is better (more realistic, healthier, and sustainable) to keep marine fish, live rock provides a great ecosystem of natural health and longevity for the fish. In coral reef tanks, I find live rock to be money saving. The quality of live rock is important, but the basic addition of a biological substrate is essential. This biological addition can greatly enhance the natural marine ecosystems.

#3 - money. We often joke around about the expense of the aquarium hobby. Much like any other hobby, there is an initial cost to acquire the basics, and the ongoing cost to keep it going. There is also the inherent fact that everything you buy for the aquarium will eventually break, wear out, or die – though hopefully not for a very long time. Eventually you will have to replace everything that you have, so be prepared.

#2 - knowledge. While it is important to understand marine chemistry, fish behavior, and coral lifestyles, it is more important to understand how things work, and how the aquarium lives and grows. The environmental impacts of irresponsibly collected livestock can be devastating by destroying the world's greatest treasure. On the other hand, aquariums can help educate about this resource. Understanding this balance and the effects of the hobby are important to the survival of the wonderful creatures involved. Be sure to encourage coral propagation and education for responsible collecting. Understanding your own aquarium is an ongoing learning process. The best way to learn about your tank is to have friends that can give ideas and advice. The best way to do this is to be part of your local aquarium club (like the Wasatch Marine Aquarium Society. Additional information can be found in books, the Internet, public aquariums, zoos, and of course in good pet stores.

#1- Time! You can't expect to have the best aquarium in town until you have some experience and a great deal of understanding. This hobby takes time. One of the best examples of this is to think of a home with a lovely garden. While it is possible to pay a gardener to provide your home with a beautiful landscape, the true gardener works in their yard for years, making little improvements here and there. As many of us know, a garden is one thing that you must take care of every single year. Once your garden looks beautiful, it won't stay that way. This is exactly how aquariums work. Things live, things die, things grow, and things need attention. Take your time and have patience!

For more information contact Adam Blundell at mailto:adamblundell@hotmail.com

The pictures below show reef aquaria of reef hobbyists and WMAS members. This is a sample of what you can see for yourself on the 2001 reef tour – you can see more at our web site http://www.utahreefs.com/