



# The Sea Star



Newsletter of the Utah - Wasatch Marine Aquarium Society 2002 WINTER OLYMPIC ISSUE Founded 1995 Issue 44 February 2002

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### Why Wasatch?

The 150 mile stretch of Rocky Mountains that runs from south of Provo, past Salt Lake City to north of Ogden is called the Wasatch Range. Most of Utah's residents live on this "Wasatch Front". Wasatch is a Ute Indian word meaning mountain pass" and Utah is an Indian name for "People of the Mountains". What more appropriate place for the 2002 Winter Olympics!

## **Upcoming meetings with famous guests!**

Julian Sprung, the hobby's foremost author and lecturer, has rescheduled his visit to the WMAS. Leading up to Julian's lecture in July will be a series of guest speakers.

Beginning with the March meeting, The Living Planet's Marine & Freshwater Science Institute at the Salt Lake Community College will be the site of future WMAS meetings.

Steve Tyree - Thursday, March 7

Ron Shimek - Friday, April 5

Eric Borneman - Friday, June 7

Julian Sprung - Friday, July 13

## **Breeding the Banggai Cardinal Fish**

*By Brad Adams*

On March 8, 2001, I set up my first 55-gallon mini-reef aquarium. The tank cycled quickly and it was time to get rid of the damsels and purchase some not so mean "reef safe" fish. While at my local fish store, beautiful Banggai cardinals caught the attention of my wife and I. The storeowner quickly informed us that these fish were great reef aquarium inhabitants and were very easy to breed. I was excited and purchased 3 adult Banggai cardinal fish. They adapted well to my aquarium and were model reef citizens. After about one month, my model reef citizens turned into reef thugs. Two of the cardinals were beating up the third cardinal. The third cardinal was close to death by the time I was able to remove him (he lives in Art Olson's reef now). I now had a pair of cardinals. Shortly after removing the third cardinal, the two remaining cardinals started a bizarre "dance" of shimmying and shaking. The next morning the male was carrying a mouth full of eggs. Occasionally, he would open his mouth and I could see the golden colored eggs. The eggs appeared to be rather large, about the size of a large pinhead. In addition, the male does not eat while incubating his eggs.

Approximately three to four weeks later, little tails were hanging out of the male's mouth. It seemed that the time was close when the babies would be released from dad's protective mouth. I netted the male and placed him into a separate 15-gallon tank. About 25-30 fry were released. The male was placed back into the main tank. He will eat the fry after they are released so it is important to separate them.

The fry are miniature replicas of their parents. They immediately feed on newly hatched brine shrimp. Many articles on raising Banggai's suggest that the fry must be feed five to six times a day. However, I only fed them twice a day and they seemed to grow well. To my knowledge, I only lost one cardinal. The cardinal was born without a tail and could not compete for food. After one week of feeding newly hatched brine shrimp, I purchased some frozen newly hatched brine shrimp. The baby cardinals quickly adapted to the frozen shrimp and my job of raising the cardinals became very easy. In



my opinion, hatching brine shrimp is a hassle. The cardinals began eating adult frozen brine about three weeks later. I did nothing special for these baby cardinals. I did not soak their shrimp in Selcon or Zoecon. I did alternate feeding adult brine shrimp with bloodworms.

**Raising Banggai cardinals is easy.** They truly are the “guppies” of saltwater. They appear to be in high demand among hobbyists. I recently read an article about the extreme harvesting of Banggai cardinals from the wild. In my opinion, there should be no harvesting of cardinals from the wild because they are so easy to breed by the average hobbyist.

**Summary:** 1. Purchase 3-4 Banggai's and allow them to pair (remove unpaired fish) 2. Feed pair well 3. When male is carrying eggs, remove him to an established small delivery tank. Make sure there are no powerheads or other mechanical devices that will injure the fry 4. Remove male when fry are released 5. Feed newly hatched brine shrimp for the first week (2-3/day) 6. Switch to frozen newly hatched brine (if you want) 7. Transition to adult brine shrimp in about 3 weeks 8. Feed a varied diet 9. Sell, trade, or give away to good homes when large enough!

Articles on breeding Banggai Cardinals

[http://breeders-registry.gen.ca.us/Articles/v4\\_i4\\_marini/marini.htm](http://breeders-registry.gen.ca.us/Articles/v4_i4_marini/marini.htm)

[http://www.eparc.com/banggai/fmarini/marsh\\_banggai.htm](http://www.eparc.com/banggai/fmarini/marsh_banggai.htm)

[http://www.eparc.com/banggai/fmarini/banggai\\_talk.htm](http://www.eparc.com/banggai/fmarini/banggai_talk.htm)

<http://www.animalnetwork.com/fish/reference/s3.asp>

## Coral Farming

*By Joe Jones*

Is Coral Farming as a cottage industry a viable adjunct to wild harvesting? Many people have the idea that the saltwater hobby and in particular the reef hobby is the primary source of problems for the world's reefs. I won't deny that we have contributed to the problems. However, I would like to present what I feel is an important movement within the reef aquarium hobby. This is the growth of coral farming by numerous hobbyists. Untold numbers of individual hobbyists have begun to trim their coral and trade them either with other hobbyists or with their local pet store. Each time this happens there is one less wild coral sold. Many hobbyists have become so proficient at the



propagation of coral that they have actually started their own business. This is what I call a Coral Farmer, when the intent is to produce income. Of course there are many non-hobbyist coral farmers. In particular are the islanders of Fiji and the Solomons and elsewhere who are cultivating wild coral in their lagoons. I believe that even those individuals that harvest the wild coral in a sustainable manner could properly be called coral farmers.

But, what I wish to address are the smaller individual farmers in the U.S. and elsewhere that are pursuing this as a cottage industry.

If you look up the definition of a farmer in Webster's Dictionary it says that a farmer is someone that operates a farm or cultivates land. In the context of my presentation I would like to expand that definition to include anyone who conducts animal husbandry of marine wildlife, particularly within a specified limited non-natural environment.

There have been a number of large scale coral farming entities started with millions of dollars invested and with varying degrees of success. Coral farming as a cottage industry on the other hand only requires a moderate capital investment for the reef hobbyist. Many coral farmers in fact only have their original tank and sell only the trimmings from their established coral. Steve Tyree has established a network of this type of coral farmer into a very viable business - Dynamic Ecomorphology - and sells most of his coral over the internet.

Coral Farmers may have several tanks and propagate just a few types of coral or may attempt to propagate and produce hundreds of coral types and species in dozens of tanks. The capital investment varies greatly depending on number of systems and type of material used. Manufactured tanks, either glass or acrylic are the most common, but, some farmers use Rubber-maid tubs also. The lighting for the systems is probably the greatest initial expense. If the prospective farmer doesn't have sufficient adult livestock, he or she will have to acquire brood stock, which will vary greatly as to cost. Water, salt and electricity are of course the largest continuing expenses. Another key requirement is the experience of the reef hobbyist to be able to maintain all the systems involved in keeping the coral in a healthy state. And, as with any business especially a farm, one must first determine who and where his/her market is.

Many varieties of coral are able to be propagated at this time, mostly the soft coral and SPS coral, although many farmers are experimenting with ways to propagate other coral. At present the most common way to propagate coral is to make clones of the original by breaking or cutting. Then you fix the cutting or "frag" to some form of substrate. Many kinds of substrate have been used - pieces of aragonite rock, either clean or live rock, artificial substrate such as aragocrete™, araga-rock, plastic faucet pieces, eggcrate or other plastic items, or PVC fittings. Actually the limiting feature is the imagination of the farmer and what is readily available. What is commonly used to affix the cutting or frag can be any of a number of items, - rubber bands, gel cyanoacrylic glues, bridal veil mesh, or natural attachment.

Some of the reasons that I feel that coral farming as a cottage industry is a viable option are: most captive grown corals tend to have brighter colors; most tend to be healthier and stronger than their wild cousins due to having lived in an artificial environment all their lives; many hobbyists really want to help prevent reef rape; and the cost of most captive grown coral is significantly lower than a wild specimen; and finally the amount of investment will not require the same amount of return as a multimillion dollar facility.

Coral farming will never totally replace the wild harvesting unless Governments arbitrarily decide to stop all wild harvesting. In which case coral farming will be the only legal option available to the hobby. Coral farmers will always need brood stock, some of which will invariably be newly harvested wild specimens. Also, there will always be a segment of the hobby who will not want anything but wild harvested coral.

There is a need to establish a system of commonly accepted standards for this segment of marine aquaculture. LeRoy Headlee of [www.garf.org](http://www.garf.org) has proposed a system of identifying coral farmed animals that I support wholeheartedly. That is there should be three levels of farmed animals - PAQ: this is a propagated coral that has been taken from a recently harvested wild coral but has been Propagated, Acclimated to life in an artificial environment, i.e., an aquarium and Quarantined so that it is obviously healthy; Tank Raised: This is a PAQ specimen that has been retained in the farmer's facility until it has at least doubled in size; and Captive Grown: this is a specimen that is at least the second generation from the wild parent. Also, something that is needed is for all governments to recognize coral farmed animals versus wild caught ones. I suggest a separate CITES classification which would allow farmed animals to be sold or traded internationally. Something else that I feel is needed is for a certification similar to what AMDA has for store owners, but, for coral farmers so that customers may know that they are receiving the best product possible. I truly believe that Coral Farming as a cottage industry is not only a viable adjunct to Marine Aquaculture in general but will prove to be a necessary part of the industry's future.

For more information contact Joe at his company, Mountain Corals, by email: [corals111@home.com](mailto:corals111@home.com).

## **Olympic Games - Coral Reefs**

*By Adam Blundell*

Here I am in the middle of the Olympic City. While walking along the streets of my home town, I'm seeing hundreds of international visitors. Set in front of the Wasatch Mountains, the 2002 Winter Olympic Games are bringing about a change. The change I'm talking about is a progression to world travel, understanding, international media attention, and multicultural communities. In other words, a progression to cosmopolitanism. In some ways, this is exactly what coral reefs are providing.

Coral reefs are an international treasure, often located in remote locations. Because of this many people are



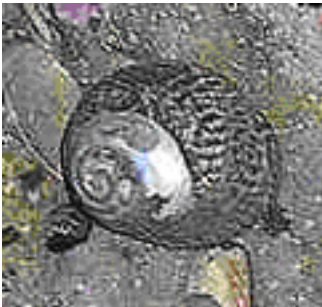
unable to view and appreciate their beauty. In addition to this, the vast majority of the world population are unable to afford the costs of world travel. But for the slight minority population (most of whom are in the western hemisphere) the possibilities of world travel do exist. This has helped foster a relatively recent trend called Ecotourism.

Ecotourism is a form of tourism where the ecological properties are the reason for the tourist destination. In addition to this, Ecotourism uses Sustainable Tourism methods which promote community involvement, site preservation, and local economy generation. This type of tourism is becoming even more common to the areas of coral reefs.

Take for example the islands of Fiji. An area known to most only as a mysterious place that probably has some forest areas, some beaches, and maybe some marine life. Unfortunately many are not able to view the beauty of the islands, but that is changing. With the desires of the average tourists changing from amusement park lovers to adventure travelers, the opportunities for exploring these areas are ever increasing. We can only hope that these opportunities will continue the trend towards preservation and understanding.

## Saving my Coral Reef

*By Mark Peterson*



Green. Just green. As far as the eye could see was green in my reef aquarium before we dumped in the little "Reef Janitors" in January, 1996. Where once beautiful live rock had colored the tank, my hobby was being choked to death by a flowing mat of hair algae. The hair algae had completely covered the live rock. Where once pink and purple coralline algae had brightened my aquarium, now only green hair flowed in the current. It was two inches long, covering everything and waving as though it were the green hair of an ugly mermaid. The substrate was likewise covered. Each little piece had a mane of long hair algae. My best efforts at physically removing it were frustrating, to say the least. For two years this algae had been gaining ground. I was at the point where I was ready to throw in the

towel and go back to my African Cichlids.

It was an innocent call one cool day in the fall of '95 that brought the little "Reef Janitors" to my aquarium. Little did I know that a call to Leroy Headlee of Geothermal Aquaculture Research Foundation (GARF) of Boise, Idaho would result in the saving of my reef. Leroy had been featured in the spring 1995 issue of SeaScope about "Live Rock Aquaculture." I asked him to come speak to our club, the Wasatch Marine Aquarium Society of Salt Lake City, Utah. (See [www.garf.org/ugly.html](http://www.garf.org/ugly.html))

The beginning of the end of my reefs' destruction began on the day after Leroy's presentation at the January meeting. It was a day of rebirth... for my aquarium that is. Leroy graciously offered to leave me with more than 300 Reef Janitors to test their power and to keep them on consignment until needed by local shops.

My coral reef was saved from utter destruction by these Reef Janitors, which are tiny red legged and tan legged hermit crabs and three kinds of snails from Mexico that eat hair algae and cyanobacteria algae. Their use in the aquarium was discovered by Leroy Headlee, telephone (208) 344-6163, [www.garf.org](http://www.garf.org)

The introduction of the Reef Janitors came just in time. During the first ten days small patches of coralline algae began to reappear. The crabs would climb to the top of a bulge of rock and pick it clean. During days 10 to 20 (the first month) the hair algae would reconquer some of those hills, but gradually, owing to the strength and number of these little soldiers, the second month saw more and more rock and substrate taken by my Reef Janitors. The algae was losing ground and "we" were winning! (200 of the janitors were sold and gone by the end of six weeks)

The snails should also receive their praise. Where before I had to scrape green algae from the glass at weekly intervals just to see my ugly mermaid, the snails immediately attacked the problem. They did so well that the next glass scraping was at about 10 weeks because of a buildup of tougher algae. But this was not nearly the same visibility problem as before. The coralline algae was growing again and it was growing on the glass too.

## The Nutrient Problem

Of course, there was a nutrient supply which created the algae problem. Two years of feedings without any real attempt to remove nutrients was the culprit. I never vacuumed because vacuuming disturbs the NNR system, yet I hadn't done anything about the grayish colored "crud" which had accumulated at sites around and under the rocks. Phosphates were abundant but nitrates had been less than 5 ppm since a change to the Jaubert / Natural Nitrate Reduction (NNR) or Live Sand method more than a year before.

The aquarium had been converted to the NNR method nearly one year prior and operated successfully during the switch. I simply moved the power heads away from the undergravel uplift tubes and 10 days later removed the tubes allowing the substrate to fill in the resulting holes. Nitrates dropped from 25 ppm to 10 pm gradually over three weeks. A couple months later, after I added a skimmer, the nitrates leveled out at around 3 ppm.

## The Solution

Several actions on my part helped the Reef Janitors reduce the algae. 1) I used a mechanical, sponge filter to strain out the uneaten bits of algae that became free floating after the crabs snipped them off. 2) I began using phosphate remover which I had never used before. 3) I turned off the lights and covered the whole aquarium with a dark bed sheet for the whole day several times weekly for the first month which seemed to facilitate the last step. 4) I removed all algae and "crud" that a 3/8 inch diameter siphon hose could pull off the rock at weekly water changes.



Any one wishing to try the Reef Janitors should not be intimidated, thinking that the main reason this worked so well for me was the sheer number of little workers I had at my command (I was fortunate that Leroy Headlee offered to set up this experiment in my aquarium). My hair algae problem was enormous, but if I had started with the recommended one crab per two gallons of water my two year growth of algae would have taken, perhaps, six months to clear. I personally recommend buying 2 or 3 per gallon and then selling the extras when they've done their job. They are tidal zone inhabitants, so are very hardy in transport out of water from one tank to another.

Reef Janitors prefer hair algae and also red and blue-green (not black) cyanobacteria algae. I discovered that in the absence of their prime food they will eat decorative algae and may even become cannibalistic when competing for a limited supply of algae. They may eat a tiny amount of coralline algae, especially some softer varieties, so, if you don't have an algae problem, use more snails than crabs. The snails are best for cleaning softer algae from glass/acrylic and rocks.

Finally, I believe that the miracle cure for one of the marine algae problems has been found. **Reef Janitors are to the reef aquarium what the Plecostomus is to the freshwater tank.** They saved my reef and allowed it not only to regain, but to improve, its life and color.

There is bright hope for our captive reefs and encouragement that the coral reefs of the world can be saved.

## **Olympic Visit ... or ... What a hobby!**

*By Michael Pantalos*

My trip to the 2002 Winter Olympics was great. The chance to high five the U.S. athletes as they entered the stadium for the Opening Ceremony was fantastic. Curling was really fun to watch, and a taste of something different. Skating was really cool too.

Although I currently live in Louisville, Kentucky, I returned to Salt Lake, my home town, to see the Olympic Games. While there I was treated to a tour of marine aquariums by Mark Peterson. Mark requested that I write an article about it for the Star, and this is it.

We began the tour at Marks house with his beautiful 75 gallon tank, complete with coral, fish, and a mangrove

filter. I've been interested in mangrove filters and was excited to see one in action. I've become a fan of skimmer-less operations, and was glad to see an example of one running smoothly. Next we went downstairs to the four other tanks he has set up. Although not as picturesque as his main tank, these were a wonder to see as well. They included his Xenia tank complete with Banggai cardinal and coral banded shrimp. One tank that interested me a lot was his tank that is setup with a power compact flood light instead of the traditional fluorescent types. I found this encouraging because it demonstrated that cheaper lighting is out there. On a recent trip to home depot I was able to work out an even more cost effective plan using the same style of compacts. The third tank was in a transition stage, covered with coralline algae, housing three Banggai and a Cowri snail. The fourth was very intriguing, an unlit tank with only tunicates (sea squirts) and sponges. I am a fan of both and was glad to see that they could be successfully cultured.

Then we were off to Adam Blundell's house with his three tanks that were equally impressive. More inspiring to me was all his work with acrylic. I've been thinking about doing some stuff with acrylic, and was enthused to see that so much can be done with it. While there we discussed the finer points of wave makers including using dump buckets, siphons, and old windshield wiper motors.

The three of us headed over to Rick Bangarter's house to see his immaculate 180 gallon tank. It was truly incredible. Nice and clean, filled with color, what a sight. There were lots of fish including a baby lion fish. I cant even start to name all the different coral there were, but there were a lot. It was most impressive.

After dropping off Adam at his house we headed over to Ross Bagshaw's house and his 110 tank that was just as impressive as the previous one. Everything was growing like crazy. Mushrooms, Xenia, Sarcophyton, Frogspawn, Ricordia, and more, it was wonderfully filled with life. I never thought I'd hear anyone complain of having too much coral. Ross credits his success to additives that he won at a WMAS meeting.

This was the end of our tour, which I found most inspiring, entertaining, and educational. Special thanks to Mark, Adam, Rick, and Ross for giving me such a wonderful experience. I'd like to close by saying that if someone could find a way to drop the salinity of the Great Salt Lake, I'd pay the electric bill for a giant heater!

## RDP for Nighttime pH Control

*By Mark Peterson*



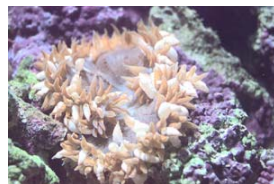
"That's a lot of algae" is what many people say when they see my Reverse Daylight Photosynthesis (RDP) tank. Inspired by John Walch, head of C-Quest Marine Ornamental Fishery in Puerto Rico, and the originator of the RDP system, I started using this on my reef tank shortly after he visited our club, the Wasatch Marine Aquarium Society, in December 1996. As of this writing, it is still located underneath my 75 gallon reef tank and has filamentous algae and macroalgae. This algae increased to a lush growth

within a few months. Always looking to improve or try something new, I added Mangrove Trees in 1998.

There is a very good reason that my reef tank has done well for so many years. I attribute it's success to the RDP system. Photosynthetic production of oxygen stops in darkness and plants become oxygen users rather than oxygen producers. The Reverse Daylight Photosynthesis tank creates a nighttime utilization of carbon dioxide and a source of oxygen which keeps the pH up in the tank after the lights go out. It also doubles as a Refugium; a place to grow algae and all the organisms that live in the algae, which fish love to eat. I harvest the extra algae from time to time giving it away to my friends who are also starting their own RDP tanks. It's not necessary to grow caulerpa but it grows fast and I like to grow the different types. In recent years a type of maroon colored tuff filamentous alga has taken over and uses the nutrients so fast that the caulerpa has become only a small part of the total algae. (Some alga are more efficient oxygen producers requiring less space than caulerpa.)

### No shrinking corals

It really works. The RDP part of the system removes carbon dioxide and supplies oxygenated water pumped up into the main tank. This keeps the coral out at night and not shrunken by morning. Such was a Flower Anemone, (pictured here) which looks exactly like the one appearing on the last page of the [Practical Guide to Corals for the Reef Aquarium](#) by Ed Puterbaugh and Eric Borneman, (Eric is visiting the



showed a striking increase in size and health since

the change. It was about 4 inches in diameter and would shrink to 2 inches at night. Before it passed away because of a Xenia crash in 2000 it actually remained about 5 inches in diameter day and night! Before the RDP, the pH fell below 8.0 at night and would only rise to 8.3 a few hours after the lights came on. Now the pH always stays above 8.1. The pH swing from day to night was cut in half and now remains within the levels recommended by the experts. I imagine that the ocean pH varies much less than this, but at least the tank is closer to natural.

### Fish without Ich

Also noticeable in my aquarium is the health of my fish. Before I gave it away because of its large size and mean disposition, I had an Eyespot Damsel that used to have a problem with the dreaded Ich. The spots were often visible on its body in the morning twilight. As the lights came on the parasite would gradually retract into the body. The damsel would frequently scratch against objects. Those symptoms completely disappeared! All the fish appear healthier. Tangs also would not live more than a few days. The current community of fish, which includes Tangs, Angels, Basslets and a pair of breeding Banggai, have all been alive since 1999.

When John Walch showed us his technique and commented that he likes plant growth, I listened up and immediately set about planning my RDP system. The purpose of this system is to absorb carbon dioxide and to provide oxygen. The simplest way to do this is to simulate night during our day and day during our night. The length of the day isn't so important but the plants in the RDP tank need to be photosynthesizing when the plants in the main aquarium are not. It appears to me that if the algae is growing well in the RDP tank that it's not able to grow as well in the main tank! Since then, many have chosen to use the RDP concept 24/7 with great success. Some drawbacks to that are greener water and increased power consumption. I am of the opinion that more is not necessarily better.

A unique characteristic of my marine aquarium is the quietness. I don't like the noise of water gurgling and splashing. I fiddle with it until I find the quietest ways to move water and still have ample circulation. Two powerheads move water within the tank and although they are placed to shoot water at each other rippling across the surface, it just isn't enough to completely exchange oxygen and carbon dioxide with the atmosphere at night. The consumption of oxygen by coralline algae and the carbon dioxide production by bacteria in the lower levels of the CaribSea aragonite substrate, I believe, combine to create the need for this new system. Of course it's not a new system, it's an old technique that John Walch inspired me to try. I am happy I tried it, because it works great.

### RDP and Plenum Together

The RDP tank has evolved over the years. It is now a 20 gal. opaque plastic storage container to which I added 2-3 inches of CaribSea aragonite with one powerhead pushing water up to the main tank. Lighted initially by two 2 ft. plant growth fluorescent tubes, this has changed to a \$30 compact fluorescent outdoor floodlight purchased from Home Depot made by Lights Of America. This change doubled the light intensity.

The tank is enclosed in the aquarium stand with a piece opaque cloth material over the back opening

to keep the light from shining out at night. The humidity stays high benefiting the Mangroves. Mangroves grow a large amount of root before showing leaf growth. Mangroves are a unique nutrient collector and a conversation piece.



Monaco Aquarium

The switch to a plenum and the Live Sand method of filtration in my aquarium began about 1994. I am a hobbyist that was inspired by Tom Frakes' fall '93 SeaScope article about Dr. Jaubert's "Red Sea Reef Mesocosms in Monaco". Unfortunately at the time, I didn't know how he avoided what I believe was happening in my tank. I believe that a general lowering of pH was occurring at night in my aquarium using the Live Sand filtration system. (This may also occur in aquariums with other types of filtration though I'm not sure because people don't normally check pH at 5:00 AM.) The

condition became more prominent as time passed and the algae gained more and more ground until I experienced the typical "crash" overgrowth of algae. I am happy to report that I eventually beat the algae. (Later the marine aquarium hobby discovered that the Monaco Aquarium was pumping clean seawater through their tanks, replacing if I remember correctly, about 10% daily!)

### Skimmer Eliminated

Here's something else. I haven't run the skimmer since long before the RDP was started. My tank flourishes. I have soft corals like never before. (No hard corals in this tank.) The Mushroom Anemones still shrink a little at night but by day they grow to a four inch diameter rather than their former two inch size. The Mushrooms are also reproducing by pinching off and by sending out little arms of flesh from the base that separate as one centimeter baby mushrooms.

Other organisms in the aquarium have been various leather corals, Xenia, Sinularia, Anthelia (Woods polyps), and what was a tiny old Condylactis anemone which, before it too passed away in my Xenia crash, had grown to one foot in diameter in 4 months, and remained on the same rock! Here are some details about my 75 gallon aquarium which had operated for several years with a plenum, but in a move across the living room (wife's orders) I removed the plenum and have seen no difference:

- 1-3 inches of fine to course CaribSea aragonite substrate
- Live rock - about 65 lbs.
- Four actinic 4 ft. normal output fluorescent tubes
- One 5000K or higher 4 ft. NO fluorescent tube

- One plant-growth 4 ft. NO fluorescent tube (for vibrant color)
- Ten fish of about 3 – 5 inches
- 100+ "Reef Janitor" crabs & snails (100's of baby snails have grown up in this tank)
- Two powerheads on the water surface
- Additives added whenever I feel like it (monthly or less frequent)
- Nitrate level - less than 2 ppm
- Calcium level - above 450 ppm
- No Kalkwasser
- KH level - 7 degrees dh

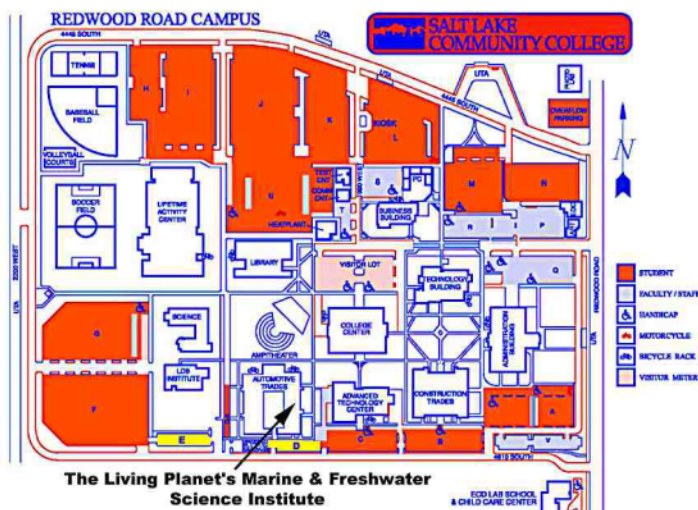
### Sponges and Sea Squirts

In 1999 the WMAS invited Steve Tyree to visit. He introduced us to the use of Sponge and Sea Squirts as efficient water filters. I tried it as soon as I could.



Now I have a separate system set up without an RDP, but with a lot of water movement for oxygen/CO2 exchange and a sponge/sea squirt sump/tank similar in position within the system to the RDP tank except that the sponge tank is unlighted. It is working great and the water is actually

cleaner and clearer than in my RDP system. There are at least four distinct major types of sponge and one type of sea squirt growing well. Steve Tyree relates in his book, The Environmental Gradient, that neither of these organisms survive well in shipping so the lack of diversity is not unexpected. The more diversity of natural filtration, the better will be our success.



The easiest way to get to the meeting is to turn east from the 4700 South Exit of I-215. Turn left (North) on 2200 West. Turn right at the SLCC entrance and then immediately right, following the road as it circles the campus on the south, ending up near the Automotive Trades building (the inverted "U" shaped building). The MFSI is in the east (right) side of the building. Parking is free in lots D and E. Parking may be a little difficult this first time so please don't get discouraged, we will work out the bugs.