Fripp Island Activity Center Aquarium Upkeep and Maintenance

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Introduction

The goal of this project is to focus on cycling the saltwater tanks that are present in the activity center and help them grow for future guests to see. This, of course, requires plenty of work and maintenance to make sure we can reach these goals. Before going too deep into the actions done to the tanks this summer, let's look into aquarium keeping in general. Many people do not realize the time and effort that aquariums need to be successful. This is especially true for newly started tank systems. Tanks require proper chemistry to be able to support life within it. This chemistry focuses on components like nutrient levels of ammonia, nitrite, nitrate, phosphate, pH, and salinity. Each can harm the tank if not managed properly. Ammonia is by far the most toxic for life within the tank and is created by animal byproducts. When checking levels this should be no higher than 0ppm. Something important to note about ammonia is that it is the start of the nitrification process. This basically means that this nutrient often takes care of itself when there is nitrifying bacteria present. This bacteria will consume and convert ammonia into nitrite. Nitrite can also be toxic and should never be higher than 0ppm as well. Nitrifying bacteria also take care of this nutrient and lead to the creation of nitrate. Nitrate is the final product of the nitrification process and is not naturally removed from the tank except through fertilization of algal blooms or plant life. Though this nutrient can fuel growth it can also be damaging to sensitive organisms like coral. To treat levels higher than 5ppm, water changes are required to physically remove those levels from the water. Phosphate is created by living things and can fuel algal blooms. More specifically, this nutrient can lead to growth of filamentous and cyanobacteria algal blooms. Levels you want in your tank would be under 0.5ppm and can be managed by doing water changes. For pH, it focuses on acidity and basicity of the water. In our tanks we aim to have a pH of about 7.8 to 8.2. It's important to make sure this is consistent in

order to keep organisms in the tank healthy. Salinity refers to the amount of salt in the water. This can be measured in parts per million or specific gravity by using a refractometer. The goal range is about 1.024 to 1.026 specific gravity. When looking at equipment, we currently are using hang-on filters. These are the most affordable and simple filters an aquarist can get. This filter is the home for all of our filtration types: mechanical, chemical, and biological filters. Mechanical filtration refers to physically removing waste and debris from the water. Chemical filtration focuses on the dissolved organic waste. Activated carbon is added to the filter media of the tanks to help remove the waste we can't see. Biological filtration is by far the most important. This is why we must have a tank cycle fully to build our biological filter. This is what it sounds like, our biological filter is based on bacteria in the tank. This bacteria makes the filter media its home and is key for the nitrification process. All of these types of filtration work together harmoniously to create clean and healthy water.

Methods and Procedures

Goals:

By using the following procedures, the goal is to better the cycling of the tank and promote a healthy environment that can flourish. These procedures should allow for proper cleaning of the tanks and methods to keep them clean. This of course is important to eventually have fish and even invertebrates in the tanks.

Water Change Procedure:

To begin a water change, filters and heaters must be turned off to prevent damaging equipment. Collect tubing, sifter, and buckets that can hold dirty water. Specifying the buckets is important for later when adding clean, new water. Take the tubing and old bucket to remove

waste by sifting through the sand and trying to remove extra algae. After removing 20% of the water from the tank (in this case 15 gallons for 75 gallon tank or about 10 gallons for the 35 gallons) stop rinse hose and other dirty equipment off.

In order to protect the bacterial community in the filter media they need to be rinsed in dirty water to remove physical waste and scum. This also helps keep the filters running properly. The exterior parts of the filter need to be rinsed and scrubbed in the sink with a toothbrush to make sure all parts are free of scum and build up. For mixing new water, use a clean, new bucket. This helps to keep from reintroducing waste into the tanks from the dirty buckets. Replace water removed with a little more water to take account of evaporation and refilling the filter. Combine salt and warm water and stir to make sure it mixes. For the saltwater tanks about 3 ½ cups will allow for 1.025 SG. Before adding water, check salinity to make sure it is right for the tank and add a dechlorinator. Pour new clean water directly back into the tank without disturbing the bottom of the tank too much. This can be done by pouring water slowly or by dispersing water flow with another container. At this time, filters can be returned and refilled to then restart. To finish up, clean up tank glass with a moist towel and wipe down with dry. Also make sure to clean up any water one the floors and wash and return all equipment used.

Feeding Procedure:

For feeding the saltwater tanks, frozen food is used and storage containers can be found in the freezer. Pill containers are used for easy dating and to separate morning and night feedings. Remove containers from the freezer and empty the proper marked slot into the empty containers to thaw the food in. These containers are different for each tank and can be identified by the colors on the containers (Green+Blue is the 35 gallon and Green+Purple is the 75 gallon). Add water to these containers from the tanks and allow to thaw. Let sit for a little while, estimate like

30 seconds to a minute, then stir and dump into the tanks. At one point, krill was used to feed the blue crabs. In that case, these were thawed out then tong fed to the crabs to ensure they could grab it. Make sure food is being eaten and should not be present in the tank after 3 minutes. This helps to keep the tank healthy without too much food collecting at the bottom. Too much collection of food and creating spikes in the chemistry. Therefore, if there is extra, remove food with the net labeled for the saltwater tanks. This process should be repeated twice a day, morning and before close.

Food Prep:

To refill the pill containers once empty, start by washing out with some dawn and hot water. Take alcohol and pads to remove previous dates and add the next week's dates in. With the amount of life in tanks constantly changing, ratios of food will also continue to change. The following can be a good base to start with.

- If there are fish they will eat morning and night (mix of plankton, brine shrimp)
    - Estimate about ½ a cube of a omnivore mixture for about 3-6 fish
- Blue crabs need protein once a day (krill, bloodworms)
    - Estimate about ¼ a cube of bloodworms or about 2-3 krill per blue crab
- Hermits, snails eat algae in tank as well as small leftovers
- Tulip snail is carnivorous and bores into mussels, snails, and clams

The important thing to note is that if there is too much food left after about 3 minutes it's too much food and must be lessened. Same can go the other way, if they seem to be clearing the tank rapidly, maybe adding some more food can make sure that there isn't too much competition among life in the tank.

Introducing new life to the tank:

When adding new life to any tank or new environment, they must acclimate; this basically means adapt and adjust to this environment. This can be done by adding some water from the tank to where you are holding the fish. After some time, like ten to fifteen minutes, add some more water from the tank. This can be repeated until the fish seems adjusted and add them to the tank. If the fish was from a store, they would most likely come in a double wrapped bag packed with air. In this case, start by setting the bags in the tank so the temperatures begin to adjust. After about ten to fifteen minutes, the bags can be cut open and clipped to the side of the tank. At this point, water can be added in small amounts to the bag to slowly let the fish become acclimated to the tank's water chemistry. This is repeated until the fish seem acclimated and then they can slowly be released into the tank. One final method is to use drip tubing. In this method, the fish can be added to a container and then water from the tank will be slowly added to that environment through the drip. All of these methods can be done successfully and some may argue certain methods are better than others. The most important thing is to take the proper time to benefit the fish in the least stressful way.

Isolation Tank Care:

With the isolation tank being so small we often see high evaporation rates. Because of this, always making sure water is high enough for the filter. This should be checked daily as well as salinity. This tank should be skimmed often and collect any debris or food remnants. Another thing to note, this taken often witnesses more decomposition because stressed out, caught fish are more likely to die versus ones that are born in captivity and used to tank life. This means more water changes and most importantly after life lives in it and possibly dies in it.

Results

After installing these procedures the following results were collected. Overall changes vary from week to week and improvements were made when necessary. This basically means adding additional water changes for higher amounts of toxic nutrients or adding more filter media to aid in cycling the water. With making these changes we can see that the chemistry improves and continues too as we develop proper bacteria in the tanks.

Dates	35gal	75gal	Isolation Tank
6/4/22	5gal	5gal	none
6/10/22	5gal	none	none
6/13/22	none	10gal	none
6/14/22	none	15gal	none
6/15/22	none	10gal	none
6/21/22	5gal	none	none
6/22/22	none	15gal	none
6/30/22	10gal	15gal	none
7/6/22	none	15gal	5gal
7/7/22	none	none	5gal
7/8/22	10gal	none	5gal
7/13/22	10gal	15gal	5gal
7/19/22	none	none	5gal
7/23/22	10gal	15gal	none

Figure 1 - Water changes and amounts removed from tanks

Subject	6/6	6/13	6/15*	6/23	6/30	7/7	7/23
pH	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Ammonia	0ppm	0.50ppm	0ppm	0ppm	0ppm	0ppm	0ppm
Nitrate	5ppm	5ppm	5ppm	5ppm	5ppm	5ppm	5ppm
Nitrite	0ppm	0.25ppm	0.25ppm	0ppm	0.25ppm	0ppm	0ppm
Phosphate	0ppm	0ppm	0ppm	0ppm	0ppm	0ppm	0ppm
Salinity	1.024	1.025	1.024	1.025	1.025	1.025	1.026
Temperature	83	83	83	83	83	79.6	82

Figure 2 - 75 gallon tank chemistry after water changes

Subject	6/6	6/11	6/13	6/23	6/30	7/23
pH	7.8	7.8	7.8	7.8	7.8	7.8
Ammonia	0ppm	0ppm	0ppm	0ppm	0ppm	0ppm
Nitrate	5ppm	5ppm	5ppm	5ppm	5ppm	5ppm
Nitrite	0.25ppm	0.25ppm	0.50ppm	0.25ppm	0.25ppm	0ppm
Phosphate	0ppm		0ppm	0ppm	0ppm	0ppm
Salinity	1.026		1.026	1.025	1.025	1.028
Temperature	83		83	84	84	80

Figure 3 - 35 gallon tank chemistry after water changes

Subject	6/13	6/15	6/23	7/7	7/23
pH	7.8	7.8	7.8	7.8	7.8
Ammonia	0.50ppm	0ppm	0ppm	1ppm	0ppm
Nitrate	0ppm	0ppm	0ppm	0ppm	0ppm
Nitrite	0ppm	0ppm	0ppm	0ppm	0ppm
Phosphate	0ppm	0ppm	0ppm	0ppm	0ppm
Salinity	1.024	1.024	1.027	1.026	1.024
Temperature	79.8	72.8	73.3	79.9	81

Figure 4 - 10 gallon isolation tank chemistry after water changes

Discussion and Conclusion

With continued work on the tanks and following these procedures, we can expect to see some great improvements to come. These tanks have finally cycled and are ready for the next steps to further our tank experiences. This has already started by adding some new reef fish to the 75 gallon. The goal of this tank is to be a representation of reef ecosystems that would not be seen around this area. The fish recently added consist of a black ice ocellaris clownfish, a bullethole ocellaris clownfish, three pajama cardinals, and a firefish goby. This is a great educational experience of relationships among fish. The cardinals can show how some fish school in order to survive. Most often seen in the wild to help with protection from predators and aid in reproduction. The clownfish show a level of dominance. This is because when they are in a pair one of the fish will compete to become the female. Lastly the firefish goby shows the loner type. For the 35 gallon tank, local life can be found here. Currently some florida pompano, a tidewater mojarra, and some striped killifish are the fish that inhabit the tank. All of the tanks contain periwinkle snails, thin striped hermit crabs, and white shrimp to aid in cleaning of the tanks. This is just a start to these tanks and much more can be done to these tanks. Upgrading equipment is going to be the hardest part. This includes getting a reverse osmosis system for our water and improving our filter systems. Making these improvements pave the way to being able

to have reef structures in the tank. Coral and other invertebrates are the most sensitive among marine life and have to be in great conditions in order to thrive. That is the endgame and what the future participants of this project should aim for.

References

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