A Report and Summary

by Steve Tyree

My goal in stocking the Ecosystem Filtration System with Reef Building Stony Corals (commonly called Small Polyped Stony Corals), was to examine the long term health of these corals as maintained by the system. My personal reefs have all been setup using the basic Berlin Method which always consists of a large protein skimmer and plenty of live rock. The Ecosystem Filter Aquarium did contain plenty of live rock, but to my surprise, lacked any type of protein skimming. The system also has a large refugia aquaria or filtration reservoir that is filled with Caulerpa macro algae. This particular species had the form of flattened feather like upright branches. I had heard plenty of rumors that Caulerpa might release toxins that could affect the health of these Reef Building Stony Corals. Then there was the additional concern of Blight disease in captivity (see Aquarium Fish Magazine May 1997). During this period, we knew the disease was coming in with imported corals, but we were still trying to determine which exporters were spreading the disease.

The Reef Building Stony corals maintained in the Ecosystem Filtration aquarium have not only survived, but are growing at natural rates. The aquarium is stocked with some very rare and exotic species of stony corals that have all been doing extremely well. In addition to this, we were able to prevent the Coral Blight disease from causing the type of outbreak that was so common in reef building stony coral aquariums during late 1996. Even today some of the advanced aquarist are still having problems with this disease. New outbreaks have occurred in captive systems that were using very efficient protein skimmers and aggressive disease dipping procedures. WE were able to prevent this coral blight from causing a problem in this system by carefully selecting corals that came from disease free exporters and by the use of Ultraviolet Sterilization. The UV modules help keep the water born bacterial levels to the normal seawater concentrations found on natural pristine reefs. We also have added a very small amount of ozone to help clarify the water. I do not consider these two additions, UV sterilizers and passive Ozone use, to be abnormal additions to a captive reef system. They are used extensively in large public aquariums and I recommend their limited use on all the Berlin /systems I currently consult on and setup. The main reason these two additions are required is to break down the coral slime Reef Building Stony corals release and to prevent bacterial buildups due to this slime. Ozone is and option in tanks I consult on and is primarily used to help clarify the water which increases upper UV-A and violet light penetration.

The use of a Caulerpa species in this Ecosystem Filtration Aquaria as the primary macro algae housed in a separate filtration aquaria, has h=not caused any algal related problems with the main Reef Building Stony Coral aquarium. There has been no outbreak of Caulerpa in the coral aquarium. The corals appear very healthy, are growing quite well and have very good polyp extension. There has been no affects to the corals due to the presence of the macro algae in the system. So the rumors that Caulerpa macro algae release toxins that affect coral seem to be untrue, at lease with respect to this particular species. The species appears to be either C. sertularioides, C. taxifolia or C. prolifera. There still is a normal growth of algae on the live rock in the coral aquarium. This is common even in Berlin systems where herbivores are required to keep certain algae from affecting the corals. The Ecosystem Coral aquarium does have a variety of herbivores (hermit crabs, astrea snails, turbo snails, etc.) that are employed to keep typical algal growths under control. The level of herbivores is equal too less than what would be required for a Berlin system the same size.

Macro algae or Turf algae based systems in the past, (see Adey and Loveland, Dynamic Aquaria), can experience a yellowing of the water. This is speculated to be caused by a buildup of the organic compounds that protein skimmers might remove. There are additional compounds that may bot be removed by skimming and usually require carbon or ozone to be removed or broken down. These compounds can cause a very hard to detect colorization of the water (see Bingman Aquarium Frontiers.).Dr. Jaubert of the Monaco Aquarium, uses a plenum design and certain bacteria to help consume or breakdown these organics. One would expect the Ecosystem Filtration System to also suffer from a yellowing of the water, since it lacks a protein skimmer and carbon. We only recently added ozone

for minor water clarification and no yellowing was perceptible to the human eye prior to its addition. In the separate aquaria where the Caulerpa is housed, a layer of fine silt or mud is found along the bottom. It is in this area where I believe most of the organics are being broken down in a manner similar to that which takes place in the Jaubert Plenum. The Caulerpa themselves also posses the ability to absorb organics as do some coral. The Jaubert Plenum System does have some complications that occur due to the thickness of the sand bed that is required (see Seascope 1997 Mike Palleta). One needs to stock the sand with a dense amount of sand dwelling organisms to keep the bed active. If these organisms are not used, organic matter can accumulate in pockets of the sand located above the plenum. Recently it has been demonstrated that the use of very fine sand of silt, can enhance denitrification and allow the use of a much thinner bed (See FAMA May 1997, Natural Nitrate Reduction by Mike Edwards). It is conceivable that beds composed of very fine material will prevent large particulate organic matter from accumulating in the bed and only allow dissolved or very finely sized organic matter to enter the bed. When using these finer materials, a much thinner bed can be installed and reliance of sand shifting organisms is not required.

I feel confident in stating that the Ecosystem Filtration System can support a thriving Reef Building Stony Coral Aquarium. This confidence was gained by me actually stocking this 400 gallon reef with corals and by observing them during the course of one year. This filtration system has shattered a couple of myths. Caulerpa do not appear to be releasing toxins that effect the corals (at least the Caulerpa species used) and a protein skimmer is not required to keep reef building stony corals. The Jaubert Plenum System also can support these corals without a skimmer, but many a reef keeper has had problems trying to maintain the proper plenum environment. This silt or mud based Ecosystem Filtration Mechanism housed in a separate aquarium seems to provide a much easier solution to breaking down organics in a system that lacks a skimmer. For those reef keepers that are looking for a more natural system that do not require skimming, this filter is definitely worth experimenting with. I would recommend that the Caulerpa macro algae be harvested in small amounts to prevent buildups of phosphate like nutrients. Another interesting point about the way in which the filter is utilized, is that the Caulerpa are given light 24 hours a day. This may help keep the oxygen levels elevated in the system water. One of the major benefits a skimmer produces in a Berlin system is its enhancement of gaseous exchange and the ability to keep oxygen levels raised. The unique way in which Caulerpa are employed in the Ecosystem Filter might help stabilize oxygen levels. If you intend to use a more natural day and night cycle, it would be better to run the Caulerpa refugia lights during the corals night period. This would help stabilize pH and dissolved oxygen levels. I would encourage those interested in trying to install a system to visit the home page of Ecosystem Aquarium. (http://www.ecosystemaquarium.com) Additional information will be available there.

The following Reef Building Stony Corals have been thriving and growing at natural rates while inhabiting the aquarium supported by the Ecosystem Filtration System. *Acropora cerealis, A.valida, A. divaricuta, A. nana, A. elseyi, A. yongei, A. samoensis, A. secale, A. abrolhosensis, A. millepora, Seriatopora hystrix, Stylophora pistillata, Montipora digitata, M. capricornis, M. tuberculosa, M. aequituberculata, Pocillopora damicornis, P. verrucosa, Pavona decussata, Leptoseris gardineri and Hydnophora rigida.*