

## Marine Aquarium Filtration

### Can you have too much filtration on a marine aquarium?

*By J. Charles Delbeek*

Q. I have a 50-gallon marine reef aquarium (I calculate the aquarium is holding approximately 45 gallons of water, plus rock and gravel). Lighting consists of one actinic white 95-watt VHO and one actinic blue 95-watt VHO driven by an Icecap 430 ballast. Filtration consists of a SeaLife Systems hang-on-the-back (HOB) protein skimmer (sized for 75 gallons) driven by a RIO 600 water pump, a Fluval 303 with sponge and ceramic media returning through a 25-watt UV sterilizer (not turned on yet), an above-tank wet/dry sump filled with Fluval ceramic media (approximately 6 liters) draining back to the tank, and one Shark internal filter pumping 200 gallons per hour for circulation. In addition, there is approximately 100 pounds of CaribSea gravel over a 1-inch high plenum with, overall, 3 to 4 inches of gravel. A fiberglass screen is 1 inch below the top layer of gravel. I started with 50 gallons of RO water, added 13 teaspoons of Kent Marine buffer (over two days) and salt. A pH of 8.0 was obtained, with a hardness of 14 dKH.

Live rock (25 pounds) was used to cycle the aquarium. This took one week. Three days later, 15 pounds of live rock was added from an existing 15-gallon aquarium, along with two colonies of mushroom anemones, a red shrimp and a rock anemone that came with the live rock.

Currently, the aquarium houses a red brain coral, a coral with 1-inch long tentacles, five small-polyped animals and a mandarin dragonet (we had copepods in the live rock from the old tank). We feed CoraLife Target food and Invertebrate Smorgasbord approximately every five days, and a small amount of frozen brine shrimp for the shrimp and anemone.

Current water chemistry readings are: ammonia 0, nitrite 0, nitrate 5 ppm (using a Red Sea test kit), pH is slightly less than 8.0 (Tetra Marine test kit), phosphate 1.5 ppm (Aquarium Pharmaceuticals dry tab test kit) and dKH 7.0. I add 60 drops of Combsan weekly — I am increasing the dosage an additional 10 drops per week until I reach 150 (the recommended dosage). I have been adding 1 teaspoon of CoraLife Invertebrate calcium supplement per week for three weeks. This week I added 2 teaspoons of the Kent Marine buffer (no readings yet).

I have the following questions/issues. I am having a hard time maintaining the pH and hardness. Any suggestions? When should I turn on the UV sterilization unit?

In a few months I will be adding more fish — a tomato or percula clown, a royal gramma, a firefish and a flame angel. Two green chromis are in the 15-gallon quarantine tank to maintain the biofilter. This aquarium will be used to quarantine all new fish. The mandarin dragonet is fine, so I don't want to add anything that will compete with it and/or do damage to the corals.

A. Your letter illustrates a common trend in many of the aquariums described in the letters I receive — too much filtration. How this happens is not clear. In some cases, hobbyists fall prey to retailers who sell them every conceivable piece of hardware, usually with seemingly plausible reasons for using each one. Or hobbyists read so much they decide that by combining all information and advice, they will have the ultimate system! This often leads to conflicting philosophies and impaired performance of the systems.

The basic problem with your aquarium setup, as I see it, is that you have a redundancy of filters and appear to have taken a shotgun approach to filtration. You have four types of biological filtration, three forms of mechanical filtration, but only one type of chemical filtration. With so much biological filtration it is very likely that they are competing for the available nutrients you are adding by feeding and the organisms are adding via waste.

The most rapid nitrification is more than likely occurring in your wet/dry and canister filters. This results in the rapid conversion of nitrogen-rich compounds into ammonia, then nitrite and finally nitrate. This is in contrast with the slower, yet methodical, conversion that takes place in the live rock and gravel/plenum system. Given this competition, it will take some time for your plenum system to cycle and begin to denitrify. All this biological activity generates acid, which in turn lowers alkalinity, which in turn will result in a decrease in pH. This is but one factor, and there may be other reasons for declining pH, which I will address shortly.

My first recommendation would be to remove the wet/dry media from the filter and also remove the media from the canister filter. I would question whether you even need to use the canister filter/ultraviolet (UV) sterilizer combination. If you find

you need them (i.e., disease outbreak) then you could easily add them at that time. I would remove both for now.

I am not familiar with the Shark filter you mention (unless you mean the Penn Plax Shark series of powerheads), but if it has a mechanical filter, it should be cleaned frequently to prevent it from becoming a biological filter as well. A simple powerhead is more than adequate for what you are trying to accomplish. To summarize, all you really need for this aquarium is the skimmer, a powerhead or two, the live rock and the gravel/plenum. That's it.

I don't understand why you decided to add so much buffer to the freshwater before you added the salt. Doing so could have disrupted the buffer system in the salt mix and may be another basis for your problem. In retrospect, you should have mixed your salt in a separate container and heavily aerated it for a few days, and then added it to the aquarium. Let the system run for a week or so and then add the live rock. Once the aquarium has cycled, measure the calcium, alkalinity and pH, and then make adjustments, if required, with buffers and so on.

I'm not sure why you are adding the liquid invertebrate foods to your aquarium. All this accomplishes is adding nutrients to the water — it is unlikely that the inhabitants are getting much benefit from these. Instead, I would recommend that you feed your shrimp and anemone small pieces of fresh shrimp directly, and omit the liquid invertebrate foods altogether. The corals in the tank may benefit from an occasional feeding as well, but if you do not see them ingest it, don't bother feeding them again.

Now, on to water chemistry. The nitrates are acceptable, but for a system as young as yours I would expect them to be lower. Removing the filters I suggested, combined with the maturation of the gravel bed, should drop the nitrates to undetectable levels within a few weeks. The phosphate level is very high! It should be 0.2 milligrams per liter or lower. The first thing you need to do is ascertain if your phosphate is really that high. I would try another kit, such as the Aquarium Systems or SeaChem low-range phosphate kit. One source of the high phosphates could be the liquid invertebrate foods. Another source could be your freshwater supply. You need to check and eliminate these problems as sources of phosphate.

On a side note, you mention the hardness level is 7.0 dKH. What you really mean is the alkalinity is 7.0 dKH. Hardness is a different parameter altogether and is measured in freshwater tanks. It refers to the combined levels of calcium and magnesium.

I have touched on some of the reasons for the low pH and alkalinity (i.e., excessive biological filtration producing acids). One thing I find puzzling is that despite all your measurements and chemical additions, you make no mention of the calcium level. All three — calcium, alkalinity and pH — are closely linked to each other, and you really need to know all three to determine what is going on in your system. Adding buffers and calcium supplements without knowing all three levels is simply acting in the dark.

The invertebrate calcium supplement you are using is most likely a calcium chloride solution. Depending on the strength of that solution, adding too much of it can actually depress the alkalinity more as it may precipitate out the carbonates associated with alkalinity. Adding excessive buffer can actually lower calcium levels too. If you rely solely on only these two types of additives, you can get into a seesaw battle between alkalinity and calcium, and the pH will also suffer.

What to do? Well, you can use some of the ionically balanced solutions now on the market to maintain both calcium and alkalinity, and, in turn, pH. Or you could make a calcium hydroxide solution and use this as your sole source of evaporation top-off water.

Finally, although many people have kept flame angels with corals successfully, many have also reported that these fish pick at corals. My advice is to be prepared to have to remove either it or the corals it likes to pick on from the tank.