

What's on Your Bottom?

photo by Khem

by Richard Ross

Deciding what to put or not to put on the bottom of your new reef tank can be daunting. Proponents of several popular methodologies make it seem like if their way is not used, your tank is doomed. Allow me to alleviate this anxiety at the outset – ALL the methodologies can work. This article will attempt to give you a general understanding of what is involved in the most popular methods. As with everything in reef-keeping, the key to success is understanding the limits of each method, choosing the method you feel will work best for you, and taking steps to make sure you keep up the maintenance on the method you choose.

Many people believe having sand on the bottom of their tanks makes their tank look more natural. After all, the bottom of the ocean is covered with sand. Even though that may be the case, it isn't necessarily true that the corals you choose to keep occur anywhere near sand in nature. Most stony corals in the wild seem to actually do their best to get as far away from sand as possible; they grow up and away from the sand, each generation of coral growing on top of the previous generation. Sand is abrasive, so in storms, or during normal wave action, being right on the sand can feel like the inside of a sand blaster. In almost all of the wild reef systems which I have had the pleasure to dive, most of the corals have been several feet above the sand, often on rocky outcroppings far above the bottom.

Besides aesthetics, the main argument for putting a sand bed in a tank is for biological filtration. Sand offers a great deal of surface area for aerobic (oxygen using) bacteria to colonize. These bacteria are responsible for converting toxic ammonia from animal waste and decomposing matter into toxic nitrite and then to less toxic nitrate, a process called nitrification. Denitrification is a similar process driven by anaerobic (non-oxygen using) bacteria that takes place in anoxic, low oxygen areas. Sand beds offer both oxygen rich

areas and oxygen poor areas for these types of bacteria. It is important to note that the biological filtration capabilities of sand can also be provided by live rock so sand is not the only option for biological filtration.

A general benefit to a sand bottom is that the light color of the sand reflects light back up from the bottom of the tank, making the tank look brighter. It may be the case that this reflected light also aids in the growth of photosynthetic corals.

When I talk about sand, I am primarily referring to aragonite sand, as it is the most widely used. There are other alternatives, but aragonite is most widely used for a number of reasons which are outside the scope of this article.

Deep Sand Beds (DSB's)

A DSB is exactly what the name purports – a deep bed of sand. The top layers of sand provide a lot of surface area for nitrification, while the deeper part of the sand bed provides a good environment for denitrification. However, it can be difficult to tell exactly how deep the sand bed should be, and hobby literature is filled with ideas. Some say that the anoxic zones needed for denitrification can occur in as little as one inch of sand, but many proponents of DSB's recommend 5 inches or more. I have seen some display tanks with as much as 10 inches of sand! Regardless of the argument regarding the optimal depth of a DSB, most agree that the deeper the sand bed, the greater the potential for denitrification.

Lots of interesting, tiny animals including starfish, copepods, worms and other



photo by Khem



A field of xenia over a poured, faux sand bed. Photo by Jim Adelberg at New Alameda Aquatics- Alameda, CA.

crustaceans will populate a DSB. These critters arrive in your tank either as hitchhikers on live rock and corals, via inoculation of live sand from another reefer's tank, or from commercial microfauna "kits". Some DSB advocates claim that the population of these microfauna is critical to the proper running of a DSB because they help break down detritus, and periodic microscopic sampling of the bed is recommended to ensure proper population levels. Many people who run DSB's say that the microfauna that populate sand beds will produce food for fish and invertebrates, but it is unclear how much food can and will be produced and what overall effect this food will have on the system. Regardless, these tiny animals can be interesting to watch, many of them emerging only at night to go about their business of eating and breeding.

One of the main concerns with DSB's is the space they take up in a display tank. If you have a 55 gallon aquarium that is 20 inches tall with a 5 inch sand bed, and you realize that a running aquarium is filled generally to an inch below the top of the tank, you are left with only 14 inches of space for fish and corals. Sand also displaces water, so the more of it you use, the less overall system volume you have and the smaller the system volume, the less stable that system is in terms of water quality. The investment in real estate that's used to display coral, combined with having to look at the dark matter that grows between the sand and the front of the tank are two of the reasons often cited for avoiding DSB's.

There are two DSB dangers that are small, but still important to note. First, DSB's can consume a lot of oxygen. This concern generally only comes up during a power outage, when the water in the tank is stagnant for any length of time. As the oxygen depletes, animals that need oxygen begin to suffer, and may die as they compete for oxygen with the sand bed. Secondly, hydrogen

sulfide can build up in the anoxic layers of a DSB. If these layers are disturbed by moving rocks that are deep in the sand, or by a fallen power head, it is possible that hydrogen sulfide can be released into the water, possibly killing animals.

Over time, generally between 3-5 years, tanks with a DSB can begin to decline or "crash". This kind of event has been loosely termed "old tank syndrome". Corals begin to die back, grow slowly or have tissue recession while nuisance algae species begin to thrive. At the same time, water tests may show that ammonia, nitrite, nitrate and even phosphate are within acceptable levels. Most likely, this problem is due to the incorrect idea that a DSB is a "set it and forget it" method, and since no maintenance of any kind was done on the DSB, it wasn't able to process all of the waste. There are many theories as to the exact mechanism responsible for these tank crashes including phosphate build up in the sand, heavy metal build up in the sand, or simply an over abundance of detritus that filled up the sand in the same way that detritus fills up a filter pad. Regardless of the mechanism, proponents of the different DSB methodologies agree that some kind of upkeep is necessary, but what that upkeep consists of depends on which DSB methodology you agree with. Some claim that you should never disturb the sand bed, some claim you should "siphon vacuum" the bed, some claim you should "siphon vacuum" only part of the bed. Some say microfauna populations are key. Some persist in the "set it and forget it" idea. Details about each of these ideas (and more!) are beyond the scope of this article, and I urge anyone considering a DSB to do lots and lots of research before making a decision.

Remote Sand Bed (RSB)

The RSB is very similar to the DSB except the sand is not in the show tank, rather in an auxiliary vessel plumbed into the system. A RSB is used for denitrification purposes only, does not need microfauna, and should be kept as free from detritus build up as possible through "vacuuming" or prefiltering the water before pumping it into the RSB vessel.

THE BEST CORALS - THE BEST FARMERS
CORAL FARMERS MARKET
 SANCTIONED EVENT
www.coralfarmersmarket.com

NorthWestern Coral Farmers Market™
 Portland Oregon
www.nw-cfm.com

SouthWestern Coral Farmers Market™
 February 24th 2008
 Ontario California
www.sw-cfm.com

Bay Area Coral Farmers Market™
 Fremont
www.ba-cfm.com

Farmed Coral Trade Shows!
 West Coast Annual Events
 Vendors and Exhibitors
 Raffles and Auctions
 Door Prizes
 Next Event www.nw-cfm.com
ONLINE AUCTIONS
coralfarmersmarket.com/cfmauctions

Shallow Sand Bed (SSB)

SSB's are generally 2 inches deep or less. SSB's are used primarily by people who like the look of sand, but don't want to lose too much display area. Some microfauna will colonize the sand, but the shallow depth has less potential for denitrification than a deeper sand bed – this does not mean that sufficient denitrification won't occur. Most people who run SSB's agree that "vacuuming" the sand, or a portion of it, is necessary for regular maintenance.



The shallow sandbed of a reef in Derawan, Indonesia. Photo by Khem.

Bare Bottom (BB)

A BB system is exactly what it sounds like – no sand on the bottom of the tank. Maintenance can be simple; change the water regularly and siphon out any detritus that collects on the bottom of the tank.

Recently, BB methodology has focused on high water movement in the display tank to keep any detritus in suspension, combined with aggressive skimming to remove the detritus before it has a chance to break down into any toxic substance. Most BB tanks also contain "live rock" for nitrification and denitrification.

Some find the BB system look ugly, but many proponents of BB disagree because without the sand, your eye focuses on the coral – the main reason why most people set up reef tanks in the first place. Often coralline algae will quickly cover the exposed glass or acrylic giving the tank a nice pink/purple bottom. Some people add an inert, marine safe material to the bottom of the

tank – most often a material called starboard. Initially, white starboard was used to add the same upward reflectivity of light that a sand bed provides, but people have started using black or other colors depending on personal preference. The choice of color may not matter in the long run since starboard will also become covered with coralline algae over time. Starboard also has the benefit of protecting the bottom of the tank from breaking in a catastrophic rock collapse (though the necessity of such protection is questionable).



A bare bottom reef in Derawan, Indonesia. Photo by Khem.

Faux Sand Bed (FSB)

The FSB is simply making the bottom of a BB tank look like it has sand. This allows for the benefits of BB while keeping the aesthetics of sand.

There are basically two ways to make an FSB - cast a mixture of marine safe epoxy mixed with sand directly into the tank or glue sand to something like starboard. Casting it directly into the tank can be problematic because the heat of the hardening epoxy can cause the tank to crack, so it is important to apply several thin layers. Gluing sand to starboard requires that the starboard be scuffed, and the glue or epoxy needs time to cure and offgass any volatile compounds left over from the glue. FSB's will also become covered with coralline algae over time, so some people add a few cupfuls of sand to the tank. This loose sand moves around due to the water flow, and helps prevent the coralline from taking hold. If you are interested in making an FSB, please do some research for the latest information and methods.



The author's faux sand bed reef tank.