Look at Live Sand

The varieties, usage and advantages, and inhabitants of live sand.

By Scott W. Michael

Q. What is live sand? I have heard fellow hobbyists talk about this concept of using sea sand for the bottom of an aquarium and wanted to know exactly what it is, where I get it and why I should add it to my reef tank. I was also told that it was important to include certain fish to clean it.

A. In 1971, Robert Riseley proposed that the inclusion of unwashed ocean sand in the home aquarium helped to "clean" the water of tanks set-up using the "natural method." European aquarists have been placing "live" sand on the bottom of their aquariums for many years, but the use of this substrate in about 1993 gained popularity in North America when articles appeared on the success of the Monaco aquarium methodology used to maintain their beautiful, natural-looking reef aquariums. The system, dubbed the "Jaubert method," included the use of live sand.

So what is live sand? This term refers to substrate that is taken from an area near a coral reef and kept damp in seawater until being placed directly into an aquarium. It is referred to as "live" because it should contain its original micro- and macro-fauna. Live sand varies in its composition depending on where it was collected, but it typically consists of coral sand (pulverized and eroded pieces of coral), pieces of the calcareous algae Halimeda and the remains of minute, shelled protozoans known as forams. Some of the sand around coral reefs is the result of the feeding activity of parrotfishes, which rasp the coral surface with their hard beaks to get at boring algae and then crush the calcareous material into fine particles. The parrotfish excrete this indigestible debris in big clouds and the resultant material ends up on the sea floor.

The live inhabitants of the sand includes aerobic and anaerobic bacteria, forams, annelid worms, crustaceans (primarily isopods, copepods and amphipods) and occasionally tiny brittle stars. The grain size varies from very fine to chunky. I prefer a medium grade for my aquariums, with grains the same size as or slightly larger than a pin head. I have found that the very fine grades may stay suspended in the water, which can clog the external filters of pumps and destroy their impellers. On the other hand, large grades are more difficult for the "clean-up crew" to keep stirred up (more on this later).

You don't have to use only live sand to cover the aquarium bottom. Many hobbyists mix "dead" aragonite sand with live sand. In this way the dead sand is inoculated with organisms, plus the coralline algae, corals, clams and so on benefit from the calcium ions released by the aragonite as it slowly dissolves.

When using live sand you can either place it directly on the aquarium bottom or you can create a space underneath the sand layer with a plenum filter. The plenum can take a number of different forms. It could be an undergravel filter plate that has had all the uplift tube holes capped or it could be some egg crate material placed on numerous "legs" created by cutting PVC pipe into 1-inch sections. You should place fiberglass screening on top of the egg crate to prevent sand from entering, and filling up the space underneath it. There are also pre-made plenums on the market. The idea to create about a 1-inch layer of water under the sand bed that will facilitate a very slow diffusion of gas through the filter bed. This will reduce the chances that hydrogen sulfide pockets will develop in the sand layer (for more on setting up a plenum see Tullock, 1977).

I would suggest using from 2 to 6 inches of live sand on the bottom of the aquarium, then place the live rock on top of it. If your reef aquarium is already running, make sure you get the sand behind and around the reef structure when you add it. One way to do this is to attach some flexible tubing to a large funnel. Then pour the sand in the funnel and use the flexible tubing to direct it around the base of the reef.

The advantages in including live sand in the reef aquarium are many. First, it looks better than a bare glass bottom and egg crate (on which the live rock sits)! It also provides refuge for those fish that bury in the substrate and invertebrates that hide and reproduce in the sand. In turn, these invertebrates can provide an important food source for fish and other invertebrates that feed on burying animals. The light color of the sand reflects light off the aquarium bottom and makes the tank look brighter. This reflected light will also benefit those zooxanthellae-bearing invertebrates near the bottom of the aquarium. Most importantly, the bacteria-laden sand will help reduce ammonia and nitrite, and the anaerobic bacteria will break the resulting nitrate down into nitrous oxide, which will diffuse from the aquarium. I have seen nitrate levels drop by half in as a little as two days after live sand was added. It is also a great way to inoculate a new aquarium with nitrifying bacteria. If that were not enough, live sand will also help maintain the pH, alkalinity and calcium levels!

The first place to look for live sand is your local aquarium store. If they do not carry it, they may be able to special order it from their live rock dealer. Be aware that sand collected from the Florida Keys and Miami region tends to be lighter in color and usually of a smaller grade, whereas that taken from the Gulf Coast tends to be gray in color, the grains are of varying size and there are lots of larger bits of rubble mixed in. I have received sand from the latter area that was crawling with worms, copepods and brittlestars, among others. Live sand is also being sent from the tropical Pacific Ocean, although it seems to be less "alive," perhaps as a result of the long travel times and possible poor treatment.

Much of the detritus that collects among the sand particles will be broken down by the heterotrophic bacteria that live on the sand grains. It is also important to keep organisms that continually turn over the sand surface. Some have discouraged the employment of fishes to carry out this task, suggesting that these animals decimate the creatures that we want to culture in the sand bed. Others believe that the job these industrious fishes do in aerating and turning over the upper layers of the sand bed is worth sacrificing some of these sand creatures.

One thing to remember is that not all areas of the tank are usually subjected to the feeding activities of substrate-disturbing fishes. So although the numbers of organisms in the sand may be reduced, there will still be areas of the tank where these organisms can be recruited from. Another way to restock the sand bed is with a refugia, with a live sand substrate, that is connected to the main display tank.

The fish that are best equipped for sand cleaning tasks feed from or bury in the sand. I classify them into one of two categories based on their work performance: primary substrate displacers and secondary displacers.

Primary displacers feed by taking mouthfuls of sand and filtering it through their gills. The best of these is the orangespotted sleeper goby (Valenciennea puellaris), an industrious substrate disturber that feeds on worms and crustaceans (especially copepods). Its mouth is like a scoop shovel — they can shove their jaws as deep as 1 inch into the sand. The biggest drawback with this fish, and all the other sleepers, is that they are prone to jumping, so the tank must be securely covered.

Although it is a primary displacer, the signal or twinspot goby (Signigobius biocellatus) should be avoided because it is difficult to keep. Even with live sand and supplemental fresh or live food they tend to loss weight and starve to death.

The gobies of the genus Istigobius, like the ornate goby (I. ornatus) and decorated goby (I. decoratus), are good substrate displacers, but they have relatively small mouths and will only stir the top ¼ inch of sand. They are very aggressive toward one another — keep only one per aquarium.

The hover gobies (Amblygobius) vary in their displacing abilities. The primary sifters of this genus include Phalaena's hover goby (A. phalaena), the tailspot hover goby (A. albimaculatus) and Sphinx hover goby (A. sphinx). Of these, Phalaena's is the most frequently available and is sold under a myriad of common names (including banded goby and pennet glider). It's good at stirring the substrate, but not as deeply as the sleeper gobies. I had one specimen (an apparently aberrant individual) that liked to rip zoanthids off a rock, chew them and then spit them out!

Rainford's hover goby (A. rainfordi) and Hector's hover goby (A. hectori) are smaller species that mostly eat algae and sift detritus on live rock. I classify these as secondary substrate disturbers.

References

Riseley, R. A. 1971. Tropical Marine Aquaria — The Natural System. Unwin Ltd., London. Pp. 187.

Tullock, J. H. 1977. Natural Reef Aquariums. Microcosm Ltd., Shelburne VT. Pp. 335.