

Aquarium Live Sand

What is live sand, where do I get it, how much should I put in my aquarium and how do I keep it clean?

By Scott W. Michael

Q. I have a 75-gallon reef aquarium with 100 pounds of Fiji live rock, lots of soft corals and a few fish. Currently, my aquarium is quite healthy — in fact, my soft corals have been reproducing and my rock is covered with coralline algae. I add several trace element supplements and do small water changes every month.

Recently, I have noticed writers in your magazine and heard local hobbyists mentioning "live sand." I have yet to get a satisfactory definition of this material and the benefits of using it. That is why I am writing you. What is live sand, where do I get it, how much should I put in my aquarium and how do I keep it clean?

A. In 1993, at the Marine Aquarium Conference of North America (MACNA), Julian Sprung shared an idea that was new to the majority of American aquarists. This idea, which had been employed by European aquarists for many years, was to place sand on the bottom of the aquarium — not just any sand, but sand that is taken from near a coral reef, kept damp in seawater and placed directly into the aquarium. It is referred to as live sand, because it contains 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 (i.e., pulverized and eroded pieces of coral), pieces of the calcareous algae *Halimeda* and the remains of minute, shelled protozoans known as forams (Order Foraminiferida).

Some of the sand around coral reefs is the result of the feeding activity of parrotfishes. These fish rasp the coral surfaces with their hard beaks to get at boring algae and then crush the calcareous material into fine particles with their specialized pharynx. The parrotfish excrete this indigestible debris in big clouds and the resulting material ends up on the sea floor.

The live component of the sand includes aerobic and anaerobic bacteria, forams, annelid worms, crustaceans (primarily isopods and amphipods) and, occasionally, tiny brittle stars. The grain size varies from very fine to chunky. I prefer a medium grade in which the grains are about the same size or slightly larger than a pinhead. I have found that the very fine grades may remain suspended because of water pumps, which can result in clogged external filters and destroyed impellers. On the other hand, large grades are more difficult for our clean-up crew to keep stirred up (more on this later).

I would suggest placing about 1 inch of live sand on the bottom of the aquarium. Then place the live rock right on the sand. If your reef aquarium is already well established, make sure you get the sand behind and around the reef structure when you add it.

Terry Siegel and Julian Sprung suggest that you attach some flexible tubing to a large funnel. Then pour the sand into the funnel and use the flexible tubing to direct it around the base of the reef. This method will help you distribute the sand around the aquarium bottom as well as prevent you from accidentally burying or upsetting your sessile invertebrates.

The advantages of including live sand in the reef aquarium are many. First of all, it looks better than a bare, glass bottom and egg crate! 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 that feed on animals that live under the substrate.

The light color of the sand reflects light off the aquarium bottom and makes the tank look brighter. This reflected light will benefit those zooxanthellae-bearing invertebrates near the bottom of the aquarium.

Most importantly, the bacteria-laden sand will help reduce ammonia to nitrite and nitrite to nitrate, and anaerobic bacteria in the sand will break this down into nitrous oxide, which will diffuse from the aquarium. The sand is a natural denitrifier in that it will help to control the buildup of nitrate in your aquarium. I have seen nitrate levels drop by half in as little as two days after live sand was added. It is also a great way to inoculate a new aquarium with nitrifying bacteria. And, if that were not enough, live sand will also help maintain your pH and alkalinity levels!

One of the most common questions I am asked is where do you find it? Obviously, the first place to try is your local aquarium store. If they do not carry it, they may be able to special order it for you from their live rock dealer. Sand

collected from the Florida Keys and the Miami region tends to be lighter in color and of a smaller grade, whereas the sand taken from the Gulf Coast tends to be gray in color, the grains are of varying sizes and there are lots of larger bits of rubble mixed in.

As far as detritus that collects among the sand particles is concerned, much of it will be broken down by the wealth of heterotrophic bacteria that live on the sand grains. But, it is also important to keep fish and invertebrates that continually turn over the sand surface. The fish that are best equipped for this task feed from or bury in the sand. I classify them into one of two categories based on their work performance — the primary substrate displacers and the secondary substrate displacers.

Many fish that feed by taking in mouthfuls of sand and sifting it through their gills are primary displacers. The best of these is the orangespotted sleeper goby (*Valenciennesa puellaris*). This goby is an industrious substrate disturber that feeds on worms and crustaceans. Their mouths are like a scoop shovel, and when they feed they shove the jaws as deep as an inch into the sand.

The biggest drawback with these fish, and all the other sleepers, is that they are prone to jumping. If you do not have a top on your aquarium they will jump out. The best way to prevent this is to use fiberglass screen and PVC or egg crate material to make a full-fitting cover that will allow the necessary gas exchange but keep your fish in the aquarium. If your sleeper disappears and you cannot find it on the floor, check the tank's overflow box!

Equally proficient at sifting, but less often seen, are the long-finned sleeper goby (*V. longipinnis*) and the twostripe sleeper (*V. helsdingenii*). If you are purchasing a twostriped sleeper I would recommend a specimen under 4 inches in length. I have had several larger individuals and they had difficulty acclimating to aquarium life.

The yellowhead sleeper goby (*V. strigata*) is one of the most readily available species and is not a bad sifter, but it is more difficult to maintain for long periods of time than the three preceding sleepers. If you are going to have success with a yellowhead sleeper goby you must feed them at least twice a day. Feeding frequency varies for the other species, but make sure you check their condition regularly to make sure they are not losing weight. I feed my sleeper gobies live black worms and pieces of fresh shrimp and clam.

Ward's sleeper (*V. wardi*) is not as active a sifter, usually limiting its activities to an area around a hole it digs under a piece of live rock. I recommend keeping a pair of sleeper gobies, but make sure you have a male and a female. This best way to ensure you have a compatible pair is to find two that are getting along together in your dealer's tank.

Although it is a primary displacer, the signal or twinspace goby (*Signigobius biocellatus*) should be avoided because it is difficult to keep. Even when kept with live sand and supplemented with fresh or live foods they tend to lose weight and starve to death.

The gobies of the genus *Istigobius*, such as the ornate goby (*Istigobius ornatus*) and the decorated goby (*I. decoratus*), are good sifters, but they have relatively small mouths and will only stir the top ¼-inch of sand. These gobies are very aggressive toward one another, so keep only one *Istigobius* per aquarium.

The hover gobies (*Amblygobius* spp.) vary as far as their displacing abilities are concerned. 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 three species, Phalaena's hover goby is the most frequently available and is sold under a myriad of common names (including banded goby and pennet glider). It is a good sifter, but does not penetrate as deep into the substrate when it feeds as the sleeper gobies. I had one specimen (an apparent aberrant individual) that liked to rip zoanths 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 spend most of their time eating algae and sifting detritus that has collected on live rock. I classify these two species as secondary substrate disturbers.

The shrimp gobies (*Ctenogobius* spp., *Cryptocentrus* spp. and *Amblyeleotris* spp.) will occasionally take mouthfuls of sediment and spit them out or filter them through their gills, but most of the time they do not feed in this manner. Therefore, I also classify them as secondary substrate displacers.

Other members of this category include those wrasses (Family Labridae) that use their heads to throw the sand to one

side when searching for food or that bury in the substrate, jawfishes (Family Opistognathidae), which build burrows in the substrate, and flatfishes (Families Bothidae, Pleuronectidae and Soleidae), which bury in the sand and hunt prey in the substrate.

Goatfishes (Family Mullidae) are primary displacers, and are particularly effective if you have lots of rubble in your substrate. These fish use their sensitive chin barbels to probe the sand and flip over pieces of rubble in search of food. The only drawback to the goatfishes is that they will eat ornamental shrimp and some species will eat small fish.

The threadfin breams and spinecheeks (Family Nemipteridae) are also primary displacers that feed by taking in mouthfuls of sand, sorting out the edible materials and spitting out the rest. Another primary displacer is the convict worm goby (*Pholidichthys leucotaenia*). This species is an industrious burrower that will dig tunnels under and around your live rock. It is great for stirring up debris that has formed in places that are often hard for other displacers to get to.

There are also invertebrates that can be employed as clean-up crews. For example, the pistol shrimp are nocturnal crustaceans that use their claws to turn over sand near their burrow entrance. Some sea cucumbers bury and burrow through the sand and feed on detritus, while serpent and brittle stars are great scavengers, helping to keep sediment from accumulating in and on the substrate.

This relationship of animals to live sand is a real plus. If you keep fish and invertebrates that help you maintain the tank, it's not necessary to siphon debris off the bottom of your aquarium! If you do not have these animals in your aquarium initially, it may be necessary to stir the sand yourself. I use a piece of large diameter rigid tubing that I have bent at one end so it looks like a golf club.