

Live Sand: Beautiful & Functional

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Not so many years ago, using sand or gravel of any sort and amount was anathema to the reef hobbyist. "It's a mess, a source of nutrient accumulation and a possible death-trap of anaerobiosis...". With the pioneering and popularizing work of such notable scientist/aquarists as Jaubert, Adey and Frakes, opinions have definitely turned around.

Live sand, actually the combination of non-living substrate and a myriad of invertebrate and bacterial life in and on it, can be a tremendous contributor to optimized and stable water quality. With some thought put into its type, amount, placement and maintenance, all reef hobbyists can benefit from Live Sand (LS) use.

A more refined word of explanation: there is considerable controversy over most issues concerning LS. There are still aquarists and industry people who eschew its use, preferring bare bottom or raised-on-plastic-grid bottoms to facilitate cleaning, and seemingly no end to discussions on which type, grade, arrangement and upkeep to apply to Live Sand implementation. It should go without stating, but here I go again, that these are merely my opinions... based on study, use and a thorough perusal of pertinent literature. You will witness many others and have to make up your own mind.

LS: Functional & Beautiful:

As with much of the reef-keeping experience, the use of Live Sand incorporates both "looks" and "doing things" functions. Though much of these benefits can be made-up by other means (supplement addition, calcium reactors, refugiums...) there are no better ways (safer, simpler, less-costly, automatic) to achieve the following benefits of using LS. Indeed to hear friends and fellow pet-fish writers Bob Goemans and Mike Paletta tell it, Live Sand is an integral, evolutionary part of successful reefing. I agree.

Water Treatment:

Do you ever wonder about the differences between a captive slice of the reef and the wild? Certainly our systems are smaller, more crowded and their control and life more mercurial. How about chemical and physical matters? Is it simply a matter of the seas being so much larger and less densely populated that accounts for their being more homeostatic in terms of pH, redox, alkalinity, dissolved concentrations of Calcium, Strontium...? To a degree, yes. The dilution effect of new water coming and going constantly and mere hugeness of the oceans serves to keep conditions more or less constant. However, to an extent, living and non-living events in and on the substrate, including "rock and sand" contribute mightily to modifying/ameliorating water quality.

Among many desirable effects, the calcareous nature of sand/LS and rock serve as an alkaline "bank", dissolving in resistance to reductive (acidifying) influences, buffering the pH upward. The same actions result in a replenishment of cations of importance to natural and captive reefs like Calcium and Strontium.

Food on the Hoof

What does most of the reef life we house do most of the time? Seek out or make "food". What could be more preferred than having some foodstuffs available at times your predatory livestock is in the search mode? Live Sand can be a great source of live foods; for some fishes (Callionymids/Dragonettes <show Synchiropus>, many Gobiids <show Amblygobius>...), the difference between success and starvation.

Live Sand, when operating ideally, consolidates and produces food organisms from what aquarists consider as wastes that might otherwise be reconstituted as bothersome micro- or filamentous algae. Physical, chemical filters, selective or not, are poorer means of removal.

Habitat

How would you like to live above a smooth reflective surface? Live Sand use aids light reflectance overall in captive reefs... and so much more. Many of your animals have an intimate association with Live Sand in the wild, and will not fare well in captivity without it. Some obvious examples are burrowing animals like the Seastars (Subclass Asteroidea) and Brittlestars (Subclass Ophiuroidea), and various sand-sifting fishes <show a Valencienna and a Istiblennius Goby, a Hermit Crab> used for that purpose by hobbyists. But there are many other groups that ingest the substrate (e.g. the Surgefishes and their relatives<show a Zebrasoma and a Siganid>) for nutrient and grinding/digestive reasons.

What Type of Live Sand is Best?

In an ideal world, you could procure the surface sand and its creatures from a similar setting as the rest of your livestock; a perfect compliment to your biotopic presentation, as the make-up and mix of organisms living on (meiofauna) and between (infauna) the substrate does vary geographically down to the micro-environment..

Realistically, a mix of the following components are what to shoot for.

Carbonate-based, non-living matrix (typically made up of coral skeletons, shells, calcareous algae matter, foraminiferans, et al. with a smattering of silicious matter). Color and texture vary quite a bit amongst live-bought and dried do-it-yourself sands, but overall you want a material that comes from the sea (versus land-mined sources) that is calcium carbonate based.

Making the Grade:

Particle size, shape, depth and uniformity are much in discourse amongst reefers. Some writers/users find very fine oolitic "dust" of less than one millimeter best, others prefer 3-4 millimeters diameter, and some even larger "rubble". For the purposes cited, I am of the 3-4mm school.

Shape should be broadly spherical (versus more two dimensional for typical silica-based substrates).

Depth depends on grade (smaller sizes should be less deep) and whether you utilize a plenum or not. You want the space betwixt all the sand to be hypoxic, that is low in oxygen (somewhere between 0.1 and 0.25ppm if you're counting), but no anoxic, i.e., lacking oxygen, for all the problems of anaerobiosis (that black, rotten-egg smelling condition) that can bring on.

Somewhere between 1-3 inches depth without a plenum and two to a few inches with one is about right.

Uniformity in your Live Sand size, shape and depth is not "the hobgoblin of little minds", and should be what you strive for. Whether you're collecting, making or buying your LS from a dealer, do your best to screen it to assure its uniformity. Standardization in turn assures maximized utility and diminished degrees of channeling and packing down.

Biodiversity:

Live Sand is much more than bacterial colonies battling it out for space and nutrients. All Phyla of marine life have residents in LS. Most writers cite segmented worms (annelids), roundworms (nematodes), crustaceans of different

sorts (amphipods, copepods), bivalves (molluscs), but there are many, many more. Hence the need to speedily and carefully handle wild-collected LS; to delay or influence this "stock" is to reduce its biodiversity.

Making your own LS from an established aquariums substrate, or simply placing Live Rock above and/or amongst some "dead", dried source of sand to make it live starts the culture with a less diverse community, but assures you of receiving useful interstitial fauna and less chance of undesirable forms.

Cured: As with Live Rock, Live Sand comprises a healthy (i.e. living) mix of attached and free living life forms", solid matter, and "muck". And identical to LR, most often the LS collected in the wild actually has too much living on it, and too much "gunk" amongst it. Like Live Rock, if you can't be absolutely certain that your new LS is cured "enough" you must cure it yourself. This is of course a much easier task in a newly set-up system without fishes, corals, etc... but new LS, sold as cured or not should at least be rinsed thoroughly with system-useable aged water prior to its introduction to the tank. Uncured or LS of dubious background should never be cured in an established system.

Placement: Once again, your LS is best placed when the system is just being set up, without your fishes and other life being present. Just the same, with care, cured LS can be added to an established tank (sump or refugium) via careful scooping and sprinkling over the bottom or non/less-living substrate. Take care to gently "rinse" off your sessile animals with a baster or powerhead to remove errant sand.

Plenum Or No?

Should you utilize a water-filled "dead" space beneath your LS? Is it absolutely necessary? Here again, there are no hard and fast rules. No, having a plenum is not critical to successful LS use. Variations on plenum construction however do assure hypoxic conditions in the LS and maximize LS functions.

Maintenance Issues:

Should you periodically stir your Live Sand, even vacuum it? In my opinion, yes. A bunch of infauna will die consequently, but the effects of sifting are warranted: removal, reshuffling of mulm, release of trapped gasses, re-assortment of life forms... all make stirring, vacuuming "worth it".

And you don't have to do all the work yourself. Biological helpers in the sand-sifting category abound. Various gobies do greater or lesser substrate disturbing, and Goatfishes (Family Mullidae) and Jawfishes (Family Opistognathidae) make this a full time career<Show a mullid and a Jaw!>

One other important aspect of LS maintenance should be mentioned, its replacement or augmentation. As time goes by, you'll notice your LS is less and less thick in depth, and maybe you'll perceive that it's shinier... and that it's buffering your pH, raising your Calcium levels, et al. less and less. No doubt about it, the non-living part of your substrate is dissolving. You need to replace or add to the LS on a quarterly or so interval. For myself, I like to push the existing LS out of an area and add non-live material (generally) to the void, gently recovering this new-sand area with existing LS. Some folks siphon out some to all of the existing LS and replace it.

Possible Downsides of Live Sand Use:

Commonly, only two real potential problems present themselves with LS use: Death of your livestock from anaerobiosis effects, and release of bound-up nutrients from rapid changes within the substrate. Let's look over both and suggest simple, safe procedures for their avoidance.

First the chance of anaerobic breakdown products being produced in the sandbed and released into the water. How can this happen? Too much food/waste getting into the LS, too little human or in-tank help in stirring the substrate, too deep a sand for the grade/lack of plenum/circulation to allow hypoxic conditions, too dissimilar grade of sand allowing packing and accumulation of nutrient sans oxygen, or wrong type/shape of sand... All easy enough for you to recognize and stay away from? Good.

The second condition comes about over time with the deposition of minerals like phosphate and their bio-concentration on the biomass in the LS. Changing conditions brought on by power outages (drop in temperature, oxygen), poor maintenance (lack of water changes, sand sifting) can lower pH, otherwise kill off the biota in the substrate. Low stocking densities, not over-feeding, good maintenance protocol, a back-up plan... that's the ticket!

Live Sand, Yes Or No?

The best way to go about utilizing Live Sand in reef systems is still a matter of sharp debate. Indeed, there are camps in the business and diversion of reef-keeping that strongly object to using a substrate at all.

Such positions are hard to defend in view of the many benefits and low costs of Live Sand implementation. The shortcomings and risks of LS use are few. Compared with other strategies of water quality enhancement, food provision and habitat enhancement there are no better ways to improve a reef aquarium than the intelligent utilization of LS.