

Water Parameters - Coral

Saltwater aquarists all seek to maintain optimal water parameters for the health and growth of their marine animals. Scientific study continues to advance our knowledge on husbandry practices that will help hobbyists to improve our approaches and have access to refined commercial testing kits and water supplements.

Because of this growing and changing knowledge base, there is variation in best practice recommendations for the aquarium industry on basic water parameters. But all agree that the most important aspect of maintaining reef aquariums is the need for consistency in water conditions – avoiding swings in water parameters. Efforts to maintain a stable ecosystem goes a long way to keeping sensitive marine animals free from stress in an environment that closely matches their natural ocean world.

PARAMETER	RECOMMENDED LEVEL	NOTES
Temperature	78° - 80° Fahrenheit	<ul style="list-style-type: none"> The world's corals are found in tropical climates located near the equator or in areas where water currents flow from the tropics. While the temperature preferences of wild corals vary depending on the location of species, NoCoast Aquatics aquacultured corals have been housed at stable temperature levels ranging from 78° to 80° Fahrenheit (~ 25-27 °Celsius).
Salinity	Salinity 30-35 ppt -or- Specific Gravity 1.023 – 1.026 sg	<ul style="list-style-type: none"> Salinity, or salt level, of the water in your aquarium is commonly measured: <ul style="list-style-type: none"> <u>Salinity</u> – Directly measure salinity levels by units of salt/sodium chloride per 1000 units, parts per thousand (ppt). A refractometer is used by testing a drop of your saltwater on a prism to measure the way the light bends to determine the salt contents of the water. This method is inexpensive, accurate and easy. <u>Specific gravity</u> – Indirectly measure salinity by measuring the specific gravity of the water. This method compares water density to pure water to determine the level of salt. Pure water has a specific gravity (sg) of 1.0, saltwater has higher density. A hydrometer is used by floating an item and measuring specific gravity using a plastic swing arm. This method is inexpensive but may result in variation in level readings because temperature changes will impact specific gravity or due to inaccurately calibrated hydrometers. Note that H₂O evaporation from your reef tank will increase your salinity levels. To replace evaporated water, “top off” with fresh H₂O, not saltwater, to maintain correct salinity levels.
pH	8.1 - 8.4	<ul style="list-style-type: none"> pH measurement shows how acidic or alkaline your water is, ranging from 0-14. Pure water has a pH of seven, saltwater has a pH of about 8.2 (more alkaline/basic). pH is commonly measured with a test kit or a calibrated electronic meter. Corals are not able to create their calcium carbonate skeleton if the pH falls below normal levels. If the level is very low, the skeleton may dissolve. If the pH is too high, calcium precipitation may result and can clog heaters and pumps. pH, alkalinity (presence of carbonate), calcium and magnesium levels are related and are important to be in balance in order to create an environment for coral health.
Alkalinity	2.5 to 4.5 meq/L or 8 - 12 dKH	<ul style="list-style-type: none"> Carbonate hardness, or carbonate alkalinity, (dKH, or degree of carbonate hardness) is a measure of the alkalinity of water due to the presence of carbonate/bicarbonate – a compound used by corals to grow their skeleton. Because it is difficult to test levels of bicarbonate directly, aquarists use a simple alkalinity titration test as an indirect test for the presence of bicarbonate/carbonate – giving confidence that corals have what they need to grow and thrive. Test kits are available to determine these levels.

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Calcium (Ca)	400-500 ppm	<ul style="list-style-type: none"> Calcium is measured with a goal of matching natural ocean calcium levels of about 420 ppm (parts per million). Test kits are available to measure calcium levels. Corals use calcium to form their calcium carbonate skeletons. Corals get most of the calcium for this process from the water surrounding them hence it is important to measure and actively manage the calcium levels in your water.
Magnesium (Mg)	1300-1400 ppm	<ul style="list-style-type: none"> Magnesium is abundant in natural ocean water with a typical level of 1285 ppm (parts per million). Corals use magnesium in building their calcium carbonate skeletons, taking magnesium from the water surrounding them. Different types of corals use different amounts of magnesium so the amount needed will depend on the mix of animals in your aquarium. Magnesium is also valuable to a reef tank as it enables the levels of calcium and carbonate to reach higher levels before they precipitate and are lost from your aquarium water. Magnesium is present in the salt mix used for reef aquarium water. It will also typically be found in commercial calcium supplements and fish food. There are magnesium supplements available for purchase along with magnesium test kits.
Ammonia (NH ₃)	0.0 ppm	<ul style="list-style-type: none"> Ammonia is produced primarily by fish waste and decaying plants and food. It is toxic to most marine animals even at low (0.01 ppm, parts per million) levels. Commercial test kits are available for measuring ammonia levels. When initially setting up a reef tank, aquarists work through a cycling phase to establish a natural biological process where ammonia is converted by bacteria to nitrites and then to nitrates. Once this cycle has been established, ammonia levels will remain at safe levels. Note that changes to the aquarium such as the introduction of a large number of new animals, decaying organisms, etc. may increase ammonia levels even in a well-established tank. Also be sure to never clean the biological portion of your filter and always keep it submerged in tank water.
Nitrite (NO ₂)	0.0 ppm	<ul style="list-style-type: none"> As a part of the initial biological cycle of a new aquarium, nitrite levels will increase as bacteria convert ammonia from animal waste products into nitrites. Nitrites are then further converted into nitrates. As this cycle begins to stabilize and reach equilibrium, nitrites will be at very low levels. Nitrite toxicity is an issue with freshwater animals but is not as toxic for marine animals. Nitrite test kits are commercially available and are often used during the set-up of new tanks to monitor the cycling process.
Nitrate (NO ₃)	< 1.0 ppm	<ul style="list-style-type: none"> Nitrates are found in reef aquariums accumulated through waste processing and with the introduction of food. A high level of excess nutrients in your aquarium may result in high levels of nitrates with undesirable algae growth. There are commercial test kits for measuring nitrate levels. High nitrate levels and algae growth can cause corals to turn brown and affect coral growth. Many aquarists have found that LPS corals prefer higher nutrient levels; some SPS keepers pursue a slight elevation in nitrate levels to enhance coral color.

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Phosphate (PO ₄)	0.02 to 0.07 ppm	<ul style="list-style-type: none"> Phosphate is a critical, building block compound for living organisms required by corals to grow tissue and skeleton; low phosphate levels in aquatic systems will limit growth. Nevertheless, aquarists often struggle with excessive phosphate build-up that creates undesirable algae growth, creates a brown algae discoloration in SPS corals and inhibits skeleton calcification. A phosphate build-up can quickly occur through the introduction of fish foods, nutrition supplements and tap water. Commercial phosphate test kits and treatment solutions are available.
Potassium (K)	380 – 420 ppm	<ul style="list-style-type: none"> Potassium is one of the major trace elements in sea water. Salt water mixes for aquariums contain potassium. Aquarists who perform water changes shouldn't need to test levels or supplement potassium.
Iodine (I ₂)	Not recommended to manage	<ul style="list-style-type: none"> Iodine is present in natural ocean environments in organic and inorganic forms. Research is underway to understand if iodine dosing should be practiced in reef aquarium husbandry to promote marine species health. Commercial iodine supplements and test kits are available for a variety of iodine forms for hobbyists who decide to dose.
Strontium (Sr)	8 – 14 ppm	<ul style="list-style-type: none"> Strontium has been found incorporated into calcifying coral skeletons; however little is known about the impact of varying levels of strontium on corals. Because of this, there is much debate and little scientific understanding of optimal strontium levels for reef aquariums, including whether supplements should be used. It is typically recommended that strontium be maintained at 8-14 ppm (parts per million); natural ocean levels are 8 ppm. If levels fall below 5 ppm, water changes should be considered.
Boron (B)	Not recommended to manage	<ul style="list-style-type: none"> There is very little scientific knowledge on the biological effects of boron on marine animals. Boron is known for its ability to increase saltwater's pH buffering capacity. It is typically recommended to maintain boron at natural ocean levels of 4.4 ppm (parts per million). Most artificial salt mixes contain boron as well as reef tank calcium and alkalinity supplements. Natural levels should be maintained through the use of salt mixes without further active management.
Silicates (SiO ₄)	0.05 ppm	<ul style="list-style-type: none"> Silica is a compound used for growth by marine animals such as mullusks, sponges and diatom algae species. Most aquarists are concerned about excessive silica levels in their aquariums as it can create rapid growth of brown diatom algae. Silica is found in tap water, fish food and other supplements. Pre-treating water, protein skimming and limiting phosphorus and silica will help control algae growth in aquariums. It is key to create a balance in reef aquariums; some hobbyists dose with additional silica to support the natural presence of algae while controlling unsightly growth rates. Test kits are commercially available.
Iron (Fe)	0.0 (Below test kit detection levels)	<ul style="list-style-type: none"> Iron is used by organisms for many biological processes. In reef aquariums, iron is especially beneficial in supporting macroalgae growth and color. Aquarists with macroalgae should consider dosing with iron through a commercial iron supplement.