# Red Sea Product Catalog | 2017

Red Sea

# Welcome to Red Sea

Since its inception over 25 years ago, Red Sea's vision has been to create a world in which marine and reef aquariums are the aquariums of choice for all hobbyists. This passion has guided the company throughout its product development and design.

Red Sea is committed to providing complete reef solutions, allowing hobbyists like you, to focus on the beauty of your reef inhabitants rather than worry about water chemistry or the suitability and compatibility of aquarium equipment.

Several significant advances in reef-keeping have been made possible due to Red Sea's commitment to research. This ongoing, original research carried out by Red Sea's dedicated team of biologists, chemists and engineers, brings great benefits to hobbyists worldwide.

Red Sea's unique research into the biochemistry of corals and their relationship with the surrounding seawater resulted in the development of the Reef and Marine Care Programs. Highly advanced yet easy to implement, the programs empower hobbyists with the knowledge and materials to understand and control the fascinating environment within their aquarium.

In keeping with the company's objective to make successful reef-keeping accessible to a wider audience, from novices to experienced hobbyists, Red Sea developed its ground-breaking range of MAX® aquarium systems. Fully equipped to support even the most delicate stony (SPS) corals, the MAX® systems are designed to blend into any contemporary home environment.

Our recently launched REEFER™ Series of reef-ready systems provide advanced hobbyists with a solid foundation for building a fully featured reef or marine aquarium using their preferred choice of equipment.

Red Sea's wide range of unique solutions enable you to spend more time enjoying your very own of coral reef, achieving long-term success and stunning results.

We invite you to learn more about these solutions and look forward to helping you make your home reef aquarium a dream come true.

# Red Sea Salts

# Red Sea Salts - A blend of science and nature

## The Source

The Red Sea, a seawater inlet of the Indian Ocean lying between Africa and Asia is one of the most beautiful, exotic and fascinating natural wonders on earth. The Red Sea supports the world's northern-most tropical reef and is an oasis of living creatures, reefs and coral formations, many of which are unique to the region. The Red Sea is blessed with the largest diversity of marine fauna of all tropical reefs around the world and has the highest density of coral per cubic meter of sea.

The unique bio-diversity of the living reef inside this magnificent region is our inspiration and the Red Sea is the source of our salts, allowing us to bring you a blend of science and nature with the living reef in every harvested grain.

## Harvest

From the pristine waters of the Red Sea, seawater is taken and transferred through a number of shallow ponds undergoing a natural evaporation process under the dry heat of the desert sun.

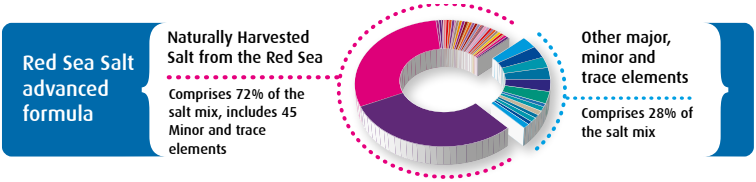
In the first pond, the seawater evaporates from its natural salinity level of 40 ppt to a salinity of approximately 250 ppt, removing all of the calcium and heavy metals from the water in the process. In subsequent ponds, further evaporation leads to the formation of sodium chloride crystals leaving other ions such as magnesium and potassium, in concentrated brine. At the end of the evaporation process, this brine is drained away. The remaining crystals of raw sodium chloride undergo a proprietary process of washing and drying to remove organic and any other impurities.

The end result is pure, white, food grade crystals of sodium chloride that comprises 47 of the other elements which are naturally present in the Red Sea. This element-enriched sodium chloride forms the basis for both of Red Sea's salt mixes and provides a blend of science and nature with the living reef in every harvested grain. Free from excessive levels of heavy metals or organics, this sodium chloride, with its natural array of minor and trace elements represents over 72% of the contents of Red Sea Salts delivering a level of quality and homogeneity almost impossible to match artificially.

The final stage in the process is to add a mix of calcium, magnesium, potassium and other elements consistently to the sodium chloride. This is done by working in small batches with strict quality control measures.

The absence of excessive levels of heavy metals in our materials prevents the need for chemical binders that adversely affect the function of protein skimmers.

## The Foundation Elements ...It's all in the balance




Natural seawater includes over 70 chemical elements and although most of the elements influence the water parameters, a few of them have a more significant role in its overall chemical stability. These elements form the foundation of the reef environment and they include the three major elements: calcium, magnesium and bi-carbonates. These three 'foundation elements' have a major effect on the water chemistry (pH stability, alkalinity, seawater ionic strength) and on many of the coral's biological processes (skeleton formation, ion- exchange, photosynthesis).

Unlike the natural reef environment, where there is an immense reservoir of the foundation elements, the reef aquarium has limited resources that are quickly depleted by the aquarium inhabitants. Therefore, in order to enable sustainable coral growth it is necessary to maintain higher than natural levels of the foundation elements.

Original research carried out in Red Sea's laboratory has shown that in a closed system (an aquarium) a specific ratio between the foundation elements of calcium, magnesium and carbonates (alkalinity) is necessary for coral vitality and the formation of a robust aragonite coral skeleton. This ratio must be maintained especially when increasing the levels of the foundation elements above the natural sea levels.

Red Sea's salts are made according to these ideal ratios and remove the need to adjust the levels of foundation elements after water changes and significantly improving the wellbeing of corals.

## Technical notes:

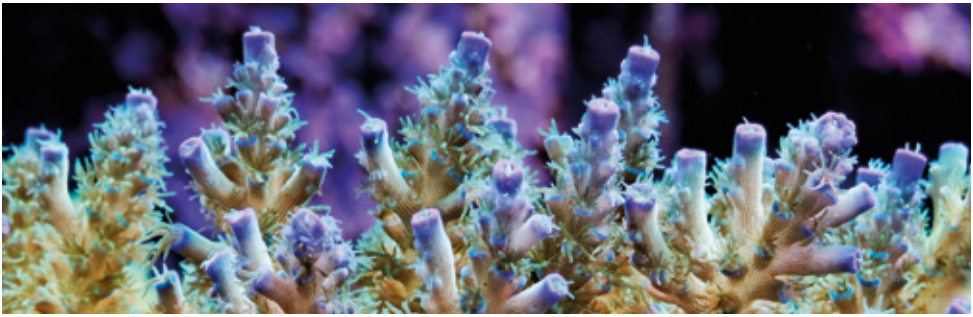
### Skeletogenesis:

Corals build approximately 90% of their skeleton by combining calcium and carbonate ions from the water to form aragonite ($CaCO_3$). The rest of the skeleton is made up from magnesite ($MgCO_3$), strontianite ($SrCO_3$), calcite (a more brittle crystal structure of $CaCO_3$), $CaF_2$ and other minor and trace minerals. The foundation elements complement each other in the formation of coral skeleton and, if not available in the correct ratio, one of them will quickly become the limiting factor of healthy coral growth.

### Accelerated Coral Growth:

Corals need to invest energy in transporting the foundation and other elements necessary for skeletal growth from the surrounding water through their soft tissue.
Elevated levels of the foundation elements create a more positive ionic pressure making this process much more efficient (less energy required per gram of skeleton).
Therefore balanced, elevated levels of the foundation elements will result in accelerated coral growth rates.

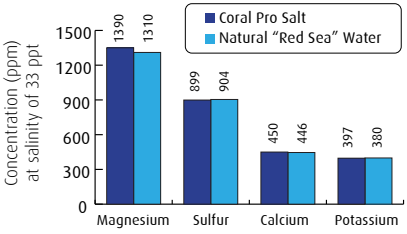
# Coral Pro Salt & Red Sea Salt

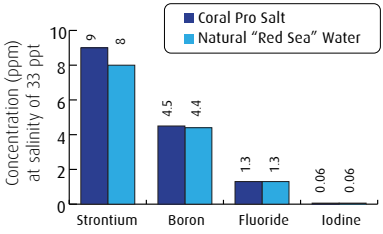


## Coral Pro Salt

Red Sea's Coral Pro Salt contains biologically balanced, elevated levels of the foundation elements (Calcium, Magnesium, Carbonates) necessary for sustainable, accelerated coral growth. Coral Pro Salt is ideal for reef aquariums, in particular for LPS and SPS corals, and for growing coral frags.


Comparative analysis of major elements in Coral Pro salt Vs. natural "Red Sea" water




Recommended usage of Red Sea Coral Pro Salt:

| Aquarium Type | Salinity | Alkalinity (°dKH/meq/l) | Ca (mg/l) | Mg (mg/l) | K (mg/l) | Dose |
|---|---|---|---|---|---|---|
| Fish / Inverts | 30.6 ppt | 3.6-3.9 / 10 - 11 | 395-425 | 1175-1255 | 335-365 | 33.4 g/l |
| Soft/LPS Corals | 33 ppt | 4-4.3 / 11-12 | 425-455 | 1270-1350 | 365-395 | 36.0 g/l |
| SPS Corals / Clams | 35 ppt | 4.15-4.45 / 11.5-12.5 | 450-480 | 1350-1430 | 385-415 | 38.2 g/l |

Red Sea Coral Pro Salt will produce stable seawater with a pH of 8.2 – 8.5.
Parameters are based on dry salt mixed with RO water.

## Red Sea Salt

Red Sea Salt is designed to provide the exact parameters of tropical reef water with a slightly elevated alkalinity as needed in a closed marine system.
Red Sea salt is ideal for fish and invertebrate systems or for low-nutrient coral tanks where the hobbyist supplements all of the individual elements on a regular basis.


Recommended usage of Red Sea Salt:

| Aquarium Type | Salinity | Alkalinity (°dKH/meq/l) | Ca (mg/l) | Mg (mg/l) | K (mg/l) | dose |
|---|---|---|---|---|---|---|
| Fish | 31.0 ppt | 2.4-2.6 / 6.8-7.3 | 365 - 395 | 1100 - 1180 | 325 - 355 | 33.4g/l |
| Non-Coral Inverts | 33.5 ppt | 2.6-2.8 / 7.3-7.8 | 390 - 420 | 1170 - 1250 | 355 - 385 | 36.0g/l |
| Corals | 35.5 ppt | 2.75 -2.95 / 7.7-8.2 | 415 - 445 | 1240 - 1320 | 375 - 405 | 38.2 g/l |

Red Sea Salt will produce stable seawater with a pH of 8.2 – 8.5.
Parameters are based on dry salt mixed with RO water

Red Sea Salt and Coral Pro Salt is available in these sizes:

| Salt Size | Coral Pro Salt | Red Sea Salt |
|---|---|---|
| **2 kg. Bag** / Water volume: 60 litrers (16 gal.) | | ✓ |
| **4 kg. (8.8 lb.) Bag** / Water volume: 120 liters (32 gal.) | | ✓ |
| **7 kg. (15.4 lb.) Bucket** / Water volume: 210 liters (55 gal.) | ✓ | ✓ |
| **22 kg. (48.5 lb.) Bucket** / Water volume: 660 liters (175 gal.) | ✓ | ✓ |
| **22 kg. (48.5 lb.) Bag** / Water volume: 660 liters (175 gal.) | ✓ | |

## Seawater Refractometer

### Calibrated for accurate sea-water salinity measurement


- Calibrated for Seawater (NSW). Measuring the salinity of seawater with a standard refractometer calibrated for brine (NaCl) solution will result in a deviation of up to 1.5 ppt.
- Calibrated at 25°C, the normal temperature range for reef aquariums. Ensures an accurate measurement of absolute salinity and conversion to Specific Gravity (Standard refractometers are calibrated at 15°C).
- Easy to read, high resolution display focused to the relevant range for reef aquariums of up to 40ppt.
- Includes Integrated Automatic Temperature Compensation (ATC) for accurate measurement at any ambient temperature.

# Reef Base Substrate

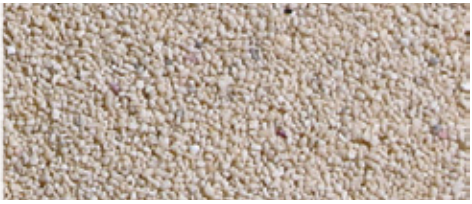
# Reef Base - Premium aragonite for marine & reef aquariums

Premium quality natural substrate aragonite high in essential elements, promotes stability of pH and alkalinity (KH) levels, easy to use and ideal for all marine fish and corals.

## Facts about Red Sea Reef base:

- An oolitic aragonite substrate, formed through natural precipitation and collected from renewable source.
- Will help maintain a stable pH of 8.2-8.3.
- Prepared by being exposed to air & UV light, screened, and mechanically washed twice.
- Live Reef Base contains millions of beneficial laboratory-engineered bacteria, which will speed up the maturation process and allow quicker introduction of corals.
- The bacteria is "gelled" onto the individual grains and packed in sterilized natural seawater.

**OCEAN WHITE |** Ø 0.25mm-1mm



**REEF PINK |** Ø 0.5mm-1.5mm

Truly renewable pure calcium carbonate oolitic aragonite sand material formed naturally through precipitation and sedimentation in the Bahamas.

## Reef Base Types:


### LIVE REEF BASE

Live premium quality, natural aragonite with beneficial bacteria to help mature new aquariums


### REEF BASE

Premium quality, natural aragonite high in essential elements

10 kg. (21 lb.) Bag

# Marine Care Program

# Marine Care Program - Introduction

The Marine Care Program (MCP) is a comprehensive, step-by-step program that enables hobbyists to achieve complete biological maturation including biological algae management. The MCP gets aquariums reef-ready to host even the most delicate (small polyp stony "SPS") coral species in approximately 21 days.

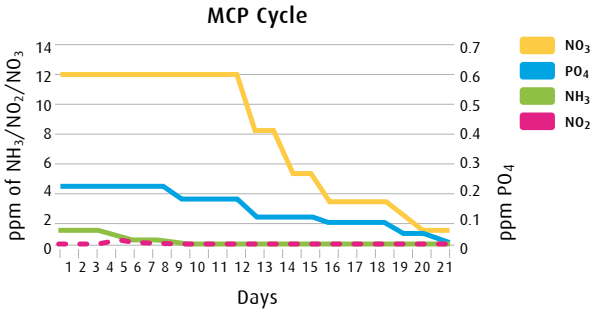
The program includes a complete kit of maturation supplements and a full complement of accurate test kits required for both the maturation process of all marine aquariums and the ongoing monitoring of key water parameters within soft coral or fish-only systems.

Most biological 'cycling' products only provide the bacteria that convert toxic waste products to nitrate. The MCP, however, completes the biological maturation process by establishing thriving colonies of anoxic (de-nitrifying and phosphate harboring) bacteria as well as ensuring the necessary conditions that will promote the growth of coralline algae and other micro fauna found in live rock and within a sand bed.

The program includes detailed instructions for each of the 21 days, including the quantities for each supplement and frequency of use, when to test the water and the results you should expect, when to do partial water changes and when to add various types of livestock.

MCP provides guaranteed results for hobbyists of all levels and prepares the hobbyist for the full implementation of Red Sea's complete Reef Care program for easy maintenance of full reef aquariums.

Graph showing the typical behavior of the significant parameters during the biological maturation cycle using the Marine Care Program.




Introduction of livestock during the Marine Care Program
(Refer to manual for details):

- Fish after 7 days
- Soft Corals after 10 days
- SPS after 21 days

## Supplements

### Reef Mature Starter Kit

Complete biological maturation supplement kit for systems up to 250 liters (65 gal).

- **Nitro Bac** - A concentrated blend of nitrifying and de-nitrifying bacteria spores to seed the live rocks, substrate and the bio-media in a new tank.
- **Bacto-Start** - A balanced blend of nitrogen and phosphorus components that simulate the natural waste products of an active aquarium, enabling a controlled development of the aerobic and anoxic bacteria.
- **$NO_3$:$PO_4$-X** - A unique complex of carbons and other organic bonded elements that are used by anoxic bacteria for the accurate control of algae nutrient (nitrate and phosphate) levels.
- **KH – Coralline Gro** - A concentrated marine buffer complex, fortified with the specific minor and trace elements that promote the growth of coralline algae and other beneficial micro-fauna.


### KH Coralline Gro

KH Coralline Gro is a complex of carbonate buffers, potassium and trace elements such as iron formulated in the ratio taken up regularly by the coralline algae. Coralline Gro should be used instead of Foundation™ KH/ Alkalinity (buffer) supplement during the cycling of all new marine aquariums and on an ongoing basis in fish-only or soft corals systems.

Coralline Gro should be dosed according to a measured drop in alkalinity with pH/KH-Alkalinity Test Kit.


Coralline algae will grow naturally, without any special supplements in all reef systems optimized for hard corals. To promote coralline algae in fish only or soft coral aquariums the alkalinity needs to be maintained at approximately 3 meq/L (8.4 °dKH) and specific minor and trace elements need to be readily available.

KH Coralline Gro is available in 100ml & 500ml bottles and includes a measuring cup for easy dosing.

## Test Kits

### Marine Care Multi Test Kit

Complete multi-test pack including all of the tests necessary to monitor the biological maturation of new systems and for the ongoing maintenance and algae management of fish-only aquariums.

The Marine Care Kit includes the tests pH, KH, ammonia, nitrate and nitrite in a durable, chemical-resistant plastic box.

All of the MCP test kits include analytical grade glass vials, full graphic instructions and easy to read color scales.

| Test Name | Element | Accuracy | Range | Test Type | No. of Tests |
|---|---|---|---|---|---|
| Ammonia | $NH_3/NH_4$ | 0.2 ppm | 0 - 2 ppm | Colorimetric | 100 |
| Nitrate | $NO_3$ | 2 ppm | 0 - 250 ppm | Colorimetric | 50 |
| Nitrite | $NO_2$ | 0.025 ppm | 0 - 1 ppm | Colorimetric | 50 |
| pH | pH | 0.1 | 7.6 - 8.6 | Colorimetric | 100 |
| Alkalinity | KH | 1 dkH/0.36 meq/L | 0 - ∞ | Titration | 55 |
| Calcium | Ca | 30 ppm | ∞ | Titration | 75 |
| Magnesium | Mg | 50/100 ppm | ∞ | Titration | 75 |
| Phosphate | $PO_4$ | 0.1 ppm | 0-32 | Colorimetric | 100 |

## Ammonia Test Kit

An advanced colorimetric test measuring the total ammonia ($NH_3/NH_4$) in marine aquariums to an accuracy of 0.2 ppm. This simple to use test kit is essential during the initial stage of the biological maturation of all marine and reef aquariums. **Includes 100 tests**.

## Nitrate/Nitrite Test Kit

This combined test kit provides either **160 nitrite or 100 nitrate plus 60 nitrite advanced colorimetric tests** for marine aquariums. This kit is essential during the maturation of all marine and reef aquariums and is suitable for ongoing algae management with Red Sea's $NO_3$:$PO_4$-X in fish-only systems.

## pH/Alkalinity Test Kit

This dual test kit includes an accurate (1 dkH/0.36 meq/l) titration test for KH and a colorimetric test for pH for monitoring these essential parameters in all marine aquariums. The KH-Alkalinity test enables accurate dosing of Red Sea's KH-Coralline Gro or Foundation™ KH-Alkalinity Buffer Supplements in fish-only systems. **Includes pH 100 tests, KH 55 tests**.

## Calcium Test Kit

Titration test provides a quick and reliable measurement of calcium in your aquarium to an accuracy of either 15ppm or 30ppm according to your needs. Kit includes easy to follow graphic instructions and conversion tables for immediate interpretation of results.
**Includes 75 tests**.

## Magnesium Test Kit

Titration test provides a quick and reliable measurement of magnesium in your aquarium to an accuracy of either 50ppm or 100ppm according to your needs. Kit includes easy to follow graphic instructions and conversion tables for immediate interpretation of results.
**Includes 75 tests**.

## Phosphate Test Kit

An advanced colorimetric Phosphate test provides a quick and reliable measurement of Phosphate in your aquarium to an accuracy of 0.1ppm $PO_4$. This test kit, in conjunction with Red Sea's Nitrite/Nitrate test kit, enables dosing of $NO_3$: $PO_4$- X (Biological Nitrate and Phosphate reducer). **Includes 100 tests**.

# Reef Care Program

# Reef Care Program - Introduction

Red Sea's Reef Care Program ("RCP") - a complete solution for:

- *Optimal coral health*
- *Accelerated coral growth*
- *Enhanced coral coloration*

The RCP is the result of years of research into the physiological demands of SPS, LPS and soft corals in reef aquariums.

The program explains how to be proactive and control all issues such as nuisance algae, coral growth and even color. This is done by:

- Describing the relationships among the many biological processes taking place in your aquarium and how they are all interrelated;
- Specifying the optimum values for all water parameters in different types of aquariums, allowing you to better understand your own particular aquarium;
- Including a concise, comprehensive and coherent range of products necessary to achieve and maintain these optimal parameters.

The RCP is divided into four distinct but complimentary sub-programs, according to the various biological processes which take place in the artificial reef environment.

## Foundation™ Program

Defines and maintains the correctly balanced levels of calcium, magnesium and carbonates for your aquarium.

## Algae Management Program

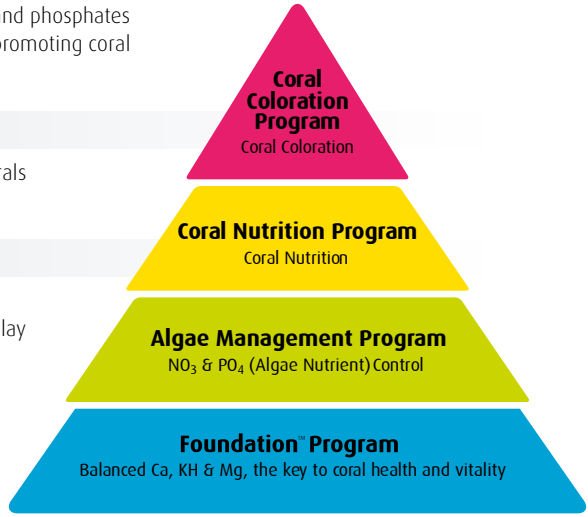
Enables controlled reduction of nitrates and phosphates preventing nuisance algae and actively promoting coral growth or coloration.

## Coral Nutrition Program

Provides the supplementary nutrition corals need for all of their metabolic processes.

## Coral Coloration Program

Accurately replenishes the 31 minor and trace elements that enable corals to display their natural colors.



# Foundation™ Program

## The Foundation Elements (Ca, KH & Mg)

A successful coral reef aquarium is dependent upon maintaining the appropriate water parameters that, in turn, provide the stable environment required by the corals. Although all the elements found in natural seawater have an important role in providing the optimal water parameters, a few of them have a more significant role in the overall stability. These elements are the foundation of the reef environment and they include the three major elements: calcium (Ca), magnesium (Mg) and bicarbonates ($HCO_3$).

These three elements have a major effect on the water chemistry (pH stability, alkalinity and seawater ionic strength) and on many of the coral's biological processes (skeleton formation, ions exchange and photosynthesis).

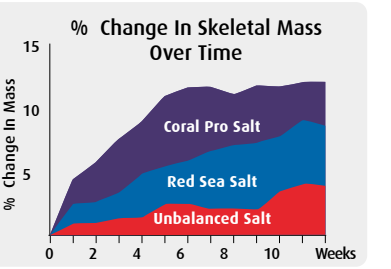
### Skeletogenesis

Skeletogenesis is the process by which special cells within the corals' soft tissue combine the foundation elements together with strontium and barium from the surrounding water to form the building blocks of coral skeletons.

Corals build approximately 90% of their skeleton by combining calcium and carbonate ions from the water to form aragonite ($CaCO_3$). The rest of the skeleton is made up from magnesite ($MgCO_3$), strontianite ($SrCO_3$), calcite (a more brittle crystal structure of $CaCO_3$), fluorite ($CaF_2$) and other minor and trace minerals.

In unbalanced conditions such as low levels of Mg and/or Sr the skeleton will develop with a higher proportion of calcite making it more brittle and more susceptible to damage.

The foundation elements complement each other in the formation of coral skeleton. If they are not available in the correct ratios, one of them will quickly become the limiting factor of healthy coral growth.




| Salt Brand | Ca | Alk | Mg | |
|---|---|---|---|---|
| Coral Pro Salt | 450 | 12.2 | 1340 | Balanced |
| Red Sea Salt | 410 | 7.7 | 1230 | Balanced |
| Unbalanced Salt | 450 | 7 | 1200 | Unbalanced |

*Seriatopora guttattus* growth rates with different $Ca_2$+ (ppm) and Alkalinity (°dKH)

## Coral Growth

Corals need to invest energy in transporting the foundation and other elements necessary for skeletogenisis from the surrounding water through their soft tissue. Elevated levels of the foundation elements create a more positive ionic pressure enabling passive diffusion of the elements through the soft tissue. This makes the process much more efficient (less energy required per gram of skeleton). Therefore, balanced elevated levels of the foundation elements will result in accelerated coral growth rates.

In mature systems where accelerated growth is not desired or when aiming to enhance coral coloration by reducing the levels of algae nutrients, lower balanced levels of the foundation elements should be maintained.

### Optimal levels of the Foundation Elements

Unlike the natural reef environment, where there is an immense reservoir of the foundation elements, the reef aquarium is an artificial environment that is constantly affected by chemical changes. Therefore, the foundation elements must be monitored and replenished constantly. Research has also shown that the optimal levels of these elements should be maintained according to the variety and maturity of the specific coral population.

In order to accurately select the optimal level for your aquarium, it is best to use the values for the most demanding species in your aquarium.

Optimal levels of salinity, KH, Ca & Mg according to type of aquarium:

| Aquarium Type | Salinity (ppt) | Alkalinity (dKH / meq/L) | Ca (mg/L) | Mg (mg/L) |
|---|---|---|---|---|
| Soft Corals | 33 | 8.2 / 2.9 | 430 | 1280 |
| LPS Corals | 33 | 12.1 / 4.3 | 440 | 1310 |
| SPS Corals, Frags / Clams - Accelerated growth | 35 | 12.6 / 4.5 | 465 | 1390 |
| SPS Corals - Mature / Low nutrient / Enhanced coloration | 35 | 8.2 / 2.9 | 430 | 1310 |

## Foundation™ Supplements

### Foundation™ Calcium+ (Ca/Sr/Ba)

Foundation™ Calcium+ Contains calcium, strontium and barium in the ratios as found in coral skeleton. [1ml will raise the Ca level of 100 liters (25 gal) by 2 ppm].

### Foundation™ KH/Alkalinity (Alk)

Foundation™ KH/Alkalinity (Alk) is a complex of carbonate and other buffers present in seawater that maintain proper alkalinity and pH. [1ml will raise the alkalinity of 100 liters (25 gal) by 0.036 meq/l (0.1dKH)].

### Foundation™ Magnesium (Mg)

Foundation™ Magnesium (Mg) is a blend of magnesium salts. [1ml will raise the Mg level of 100 liters (25 gal) by 1ppm].

### Foundation™ ABC+

Foundation™ ABC+ contains calcium, strontium, barium, bicarbonates, magnesium, potassium, boron, iodine and bromine formulated in the exact ratio as found in the coral skeleton. This unique powder supplement simplifies the daily dosing of more than just the foundation elements and is recommended for aquariums up to about 300 liters (75 gal).

Foundation™ Calcium+, KH/Alkalinity & Magnesium are available as liquid supplements in 250ml bottles (3x 250ml Pack), 500ml bottles (which include a measuring cup for easy dosing) and 5L.

1kg powder supplements are available for larger aquariums.

## Foundation™ Test Kits

The Foundation™ Test Kits include calcium, alkalinity and magnesium as individual tests. The Foundation™ Pro Kit combines the three individual tests in one convenient to use kit. All of the foundation kits include analytical grade glass vials and an easy to use, single hand, high precision titrator.

| Test Name | Element | Accuracy | Range | Test Type | No. of Tests |
|---|---|---|---|---|---|
| KH/ Alkalinity Pro | KH | 0.05 meq/l | ∞ | Titration | 75 |
| Calcium Pro | Ca | 5 ppm | ∞ | Titration | 75 |
| Magnesium Pro | Mg | 20 ppm | ∞ | Titration | 75 |

Replacement test kit reagents are also available in refill kits.

# Algae Management Program

## Coral's Symbiotic Zooxanthellae Algae

Understanding the role played by the symbiotic Zooxanthellae algae and their relationship with the coral is essential for successful implementation of the algae management program.

In nature, corals host Zooxanthellae populations at densities of 0.5 - 5 million/$cm^2$ that are located inside the coral soft tissue. The corals derive approximately 85% of their energy from the Zooxanthellae and produce the remaining 15% in their soft tissue by metabolizing coral nutrients (carbohydrates, amino and fatty acids) that are available in the surrounding water. This energy fuels all of the corals' metabolic processes such as protein production and skeletogenisis.

The Zooxanthellae use the strong sunlight on the tropical reef as their primary energy source and pass on up to 95% of their photosynthesis products (carbohydrates, amino and fatty acids) to their coral host, utilizing the balance for their own metabolic processes. The coral host provides the Zooxanthellae with nutrients, nitrogenous compounds, phosphates and $CO_2$. It is this symbiotic relationship, involving the recycling of nutrients, that is the key to its ecological success.

Another aspect of this symbiosis relates to photo-protection from strong radiation. In nature, the Zooxanthellae protect the corals from intense ultraviolet (UV) radiation by absorbing the light energy and shading the delicate inner layers of the coral soft tissues.

In nature, the Zooxanthellae population is controlled by the algae nutrients (nitrates and phosphates) excreted by the coral, however in an artificial reef aquarium the amount of algae nutrients accumulate rapidly and if left uncontrolled will induce an over-density of the Zooxanthellae populations.

The high nutrient induced over-density of the Zooxanthellae population disturbs the natural balance causing competition between the Zooxanthellae and the coral for the available resources. Without any additional nutrition, the coral may become undernourished. As well, the increase in Zooxanthellae population causes the corals to become darker with a deep brown tint that obscures the natural vivid pigments of the coral. Higher Zooxanthellae population densities within the acceptable range will however provide the coral with the energy required for accelerated growth.

Reducing the algae nutrients in the water will reduce the Zooxanthellae population to the level that can only be supported by the algae nutrients supplied directly by the coral.

Under these conditions the coral will receive less energy from the Zooxanthellae and will have less protection from the UV radiation. In this situation, if suitable coral nutrients (carbohydrates, amino acids and vitamins) are readily available in the water, the soft tissue of the coral can increase its internal production of energy. Assuming this and the necessary trace elements are available in the water, the coral will increase its natural UV protection by enhancing pigmentation of the soft tissue. This can be seen as an enhanced coloration.

## Algae Nutrient control

Micro-biological reduction of algae nutrients (nitrates and phosphates) occur naturally in all anoxic areas of the aquarium (inside live rocks, porous filter media and substrates). Supporting the natural processes by regular dosing of a suitable carbon source and mineral co-factors, provides an easy and reliable method of incremental control of the algae nutrient levels to safely control both the presence of nuisance algae and the population of the symbiotic Zooxanthellae.

## Supplement

### $NO_3$:$PO_4$-X

$NO_3$:$PO_4$-X is a unique complex of carbons that are used by nutrient reducing bacteria. Each carbon in the complex is utilized by different strains of microorganisms while ensuring the specific Carbon:Nitrogen:Phosphorus ratio required for each stage.

The complex includes other organic-bonded elements that are important stimulators in each stage of the reduction process. These metal and non-metals elements ensure steady bacterial propagation, complete nitrate reduction to nitrogen gas as well as the absorption and utilization of phosphate by the bacteria.

The fine control of the nitrate and phosphate levels provided by monitored dosing of $NO_3$:$PO_4$-X guarantees the gradual changes and accurate maintenance of the nutrient levels. This prevents the destruction of the Zooxanthellae population that can cause UV shock and starvation of corals.

Unlike some other low-nutrient regimes, correct use of $NO_3$:$PO_4$-X will maintain all of the micro - fauna that are beneficial for the reef. $NO_3$:$PO_4$-X is also recommended as a complete carbon source for use with carbon -based de-nitrators.

$NO_3$:$PO_4$-X is available in 100ml, 500ml and 1000ml bottles and includes a measuring cup for easy dosing.

## Test Kits

### Nitrate & Phosphate Pro Test Kits

Red Sea's **Nitrate & Phosphate Pro Test Kits** with an easy to use colorimetric comparator, provide the high accuracy required for the accurate dosing of $NO_3$:$PO_4$-X enabling complete control of algae nutrient levels. The Algae Control kit combines the two individual tests in one convenient to use kit.

| Test Name | Element | Accuracy | Range | Test Type | No. of Tests |
|---|---|---|---|---|---|
| Nitrate Pro | $NO_3$ | 0.125 ppm | 0-64 ppm | Comparator | 50 |
| Phosphate Pro | $PO_4$ | 0.02 ppm | 0-5 ppm | Comparator | 100 |

Replacement test kit reagents are also available in refill kits.

Comparison of various methods for Nitrate & Phosphate reduction:

| Reduction methods | $NO_3$ reduction | $PO_4$ reduction | Controlled reduction | Essential equipment | Technical comments |
|---|---|---|---|---|---|
| $NO_3$:$PO_4$-X | Yes | Yes | Yes | Protein skimmer | Researched and tested formula that includes all of the necessary elements for the balanced and controlled, long term reduction of both $NO_3$ & $PO_4$ without the need for reactors or replacement media. |
| VSV (Vodka + Sugar + Vinegar) | Yes | Yes | Yes | Protein skimmer | Rapid reduction of $NO_3$ and $PO_4$ however over the long term, a lack of essential elements will reduce effectiveness and may lead to the collapse of the bacteria population. System can produce $H_2S$ which is toxic for corals and fish. |
| Vodka or Ethanol | Yes | No | No | Protein skimmer | Rapid reduction of $NO_3$ but does not reduce $PO_4$. If not combined with additional $PO_4$ reduction the N:P ratio will be disturbed leading to outbreaks of cyanobacteria. Over the long term a lack of essential elements will reduce effectiveness and may lead to the collapse of the bacteria population. System can produce $H_2S$ which is toxic for corals and fish. |
| De-Nitrators | Yes | No | No | De-Nitrification reactor | Rapid reduction of $NO_3$ but does not reduce $PO_4$. If not combined with additional $PO_4$ reduction the N:P ratio will be disturbed leading to outbreaks of cyanobacteria.<br>Carbon Systems: Inherently unstable and difficult to regulate. System can produce $N_2O$ and $H_2S$ which is toxic for corals and fish. Over the long term a lack of essential elements will reduce effectiveness and may lead to the collapse of the bacteria population.<br>Sulphur Systems: Relatively low maintenance however they easily become clogged and can cause sudden pH drops. |
| $NO_3$ / $PO_4$ removers | Yes | Yes | No | Media reactor | Rapid but uncontrolled reduction of $NO_3$/$PO_4$ that can easily cause stress to corals. Some products such as Zeolite/ Ferric Hydroxide ion exchangers typically release undesirable cations. Lower quality products may also release undesirable metals (Al, Fe). |
| Refugium | Yes | Yes | No | Refugium | Low maintenance but slow and uncontrolled $NO_3$/$PO_4$ reduction. In the event of collapse of the algae population allelochemicals (toxins for corals) are released to the system. |

# Coral Coloration Program

Red Sea's research has identified 31 minor and trace elements that in addition to the foundation elements are present in the skeleton and soft tissue of all corals. The Trace-Colors™ Supplement family divides these elements into four groups - Trace-Colors™ Iodine+, Potassium+, Iron+ and Bioactive Elements that are related by the biological functions they perform. They are also associated with the production of specific color pigments in the soft tissue of stony corals. These pigments can only be produced if the specific elements required for the bio-chemical process are available in the correct concentration. All 31 elements are required by all stony corals irrespective of the actual color the coral displays.

## Supplementing to a measured uptake

Trace-Colors™ supplements have been formulated such that the ratio of the elements in each supplement is the same as that found in the skeleton and soft tissue of corals.

Our research has identified a constant ratio between each of the Trace-Colors™ and the overall consumption of calcium, which is proportional to coral growth and metabolic activity. This provides an easy and safe method of dosing all Trace-Colors™ Supplements based on a measured calcium uptake.

Trace-Colors™ Iodine+, Potassium+ and Iron+ each contain a leading element (iodine, potassium and iron) that is accurately measurable with Red Sea's unique Trace-Colors™ Pro Test Kits. For more advanced LPS and SPS aquariums Trace-Colors™ Iodine+, Potassium+ and Iron+ can therefore be dosed precisely according to the total demand of the reef for these elements.

## Trace-Colors™ Supplements

### Trace-Colors™ Iodine+


Trace-Colors™ Iodine+ is a complex of halogens (iodine, bromine and fluorine). The halogens act both as antioxidants and oxidative agents within the soft tissue and mucus layer of corals, reducing the possibilities for coral bleaching. In active reef system these elements are depleted very quickly due to their high oxidative abilities and reactivity with organic materials. Iodine and bromine are related to the pink chromo-protein (pocciloporin).

### Trace-Colors™ Potassium+

Trace-Colors™ Potassium+ is a complex of potassium and boron. Potassium has an essential role in the transportation of coral nutrients within the soft tissue including the nutrients provided by the Zooxanthellae. Potassium and boron have a significant effect on the alkalinity inside the coral soft tissue and play a role in the formation of aragonite in the coral skeleton. Potassium is related to the red chromo-proteins.

## Trace-Colors™ Iron+

Trace-Colors™ Iron+ is a complex of 8 "light" metals that includes iron, manganese, cobalt, copper, aluminum, zinc, chrome and nickel. Essential micro-elements with fundamental roles in many bio-chemical metabolic processes including respiration and production of energy, chlorophyll and photosynthetic catalysts. Trace-Colors™ Iron+ elements are related to the green/yellow chromo-proteins.

## Trace-Colors™ Bioactive Elements

Trace-Colors™ Bioactive Elements is a complex of 18 trace elements. These 18 elements (out of all the trace elements in NSW) participate in different metabolic processes inside coral skeleton and soft tissue. Trace-Colors™ Bioactive Elements are related to the blue/purple chromo-proteins.

All Trace-Colors™ supplements are available individually in 500ml bottles and as a complete Colors intro-pack containing a 100ml bottle of each of the 4 supplements. Individual supplements include a measuring cup for easy dosing.

# Trace-Colors™ Test Kits

## Iodine Pro Test Kit

The Iodine Pro Test Kit provides 50 high accuracy colorimetric tests with an accuracy of 0.01 ppm for the precise dosing of Trace-Colors™ Iodine+ supplement.

## Potassium Pro Test Kit

The Potassium Pro Test Kit provides 40 high accuracy titration tests with an accuracy of 3 ppm for the precise dosing of Trace-Colors™ Potassium+ supplement.

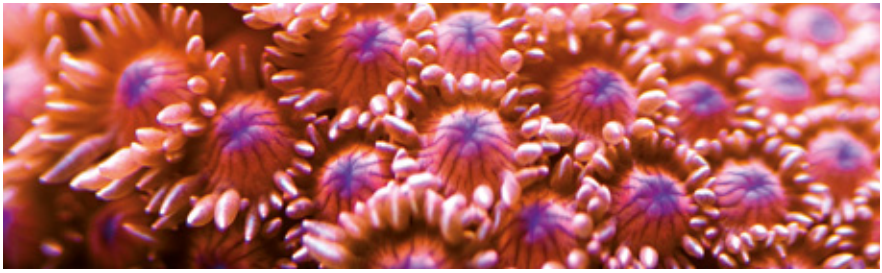
## Trace-Colors™ Pro Test Kit ($I_2$,K,Fe)

The Trace-Colors™ Pro Test Kit ($I_2$,K,Fe) combines 3 individual tests in one convenient to use kit for the precise dosing of Trace-Colors™ Iodine+, Potassium+ & Iron+ supplements.

| Test Name | Element | Accuracy | Range | Test Type | No. of Tests |
|---|---|---|---|---|---|
| Iodine Pro | $I_2$ | 0.01 ppm | 0-0.09 ppm | Colorimetric | 50 |
| Potassium Pro | K | 3 ppm | 150- 450 ppm | Titration | 40 |
| Iron Pro | Fe | 0.05 ppm | 0-0.5 ppm | Colorimetric | 50 |

Replacement test kit reagents are also available in refill kits.

# Coral Nutrition Program



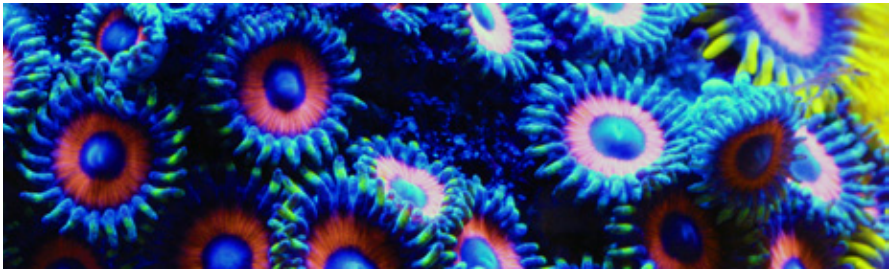
Referred to as photosynthetic, most corals have a symbiotic relationship with Zooxanthellae algae, which provide around 85% of their nutritional requirements. The coral nutrition program is about providing the remaining 15% to the photosynthetic corals and the complete nutritional requirements for the so called non- photosynthetic corals such as Gorgonia or Sun Corals that do not have any Zooxanthellae.

Corals can't move towards food or even bring the food to themselves so they digest any Dissolved Organic Matter (DOM) that flows freely into their oral disc (about the size of a pin head) or gets absorbed through their soft tissue. On the reef the DOM comes from a wide range of organic sources such as the mucus from neighboring corals or bacterial flocks.

Red Sea's nutrition research focused on isolating the various DOM components from a variety of conventional and non-conventional food sources to create an easily digestible and highly nutritious DOM complex that:

- Provides all of the energy components that Soft, LPS, SPS and non-photosynthetic corals utilize for growth and coloration
- Gives the greatest energetic value after digestion
- Causes the least pollution to the water

The amount of coral nutrients required will be dependent on the type of corals stocked. The nutritional requirements of SPS corals in particular are also dependent on the levels of algae nutrients (nitrate & phosphate) in the water. In reduced algae nutrient systems e.g. when using Red Sea's $NO_3$:$PO_4$-X, the amount of energy the corals receive from the Zooxanthellae is significantly reduced and therefore higher levels of coral nutrients must be provided to meet the corals energy demands.



## Coral Nutrition Supplements

Reef Energy® is a 2 part complete nutritional formula that provides all of the energy, amino acids and vitamins corals utilize for growth and coloration.

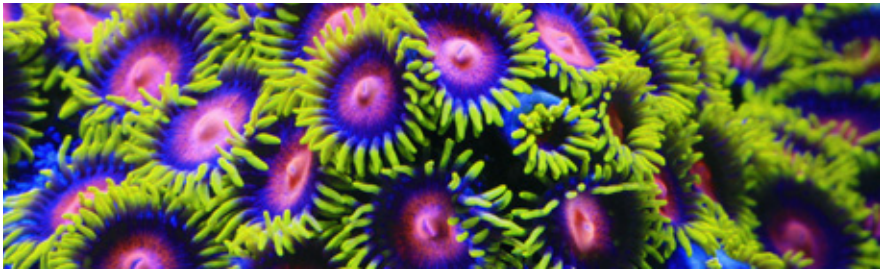
### Reef Energy® A


Reef Energy® A is a unique formulation of carbohydrates, amino acids, fatty acids and suspended protein flocks which are available for direct consumption and absorption by the corals. The suspension of protein flocks promotes the micro bacterial fauna that naturally populates the coral tissue and will increase mucus production. Every component is utilized in the metabolic processes of coral protein production and soft tissue regeneration and therefore does not introduce any unnecessary organic material to the system. Reef Energy® A stimulates extension of the polyps and soft tissue, helping the coral to optimize nutrient consumption by expanding its surface area for absorption.

### Reef Energy® B


Reef Energy® B is a highly concentrated complex of Vitamins & Amino acids that were found to be the limiting factors in the nutritional demands of corals and other invertebrates. This complex replenishes the exact vitamins and MAA (marine amino acids) produced by Zooxanthellae. Vitamins are important precursors in the synthesis of chromo proteins while the amino acids are their building blocks. All of the components of Reef Energy® B come from marine sources and are emulsified in a unique medium that enhances their solubility and absorption of the vitamins and acids by the corals.


Reef Energy® A & B are available individually in 500ml bottles and as an intro-pack containing a 100ml bottle of both A & B.

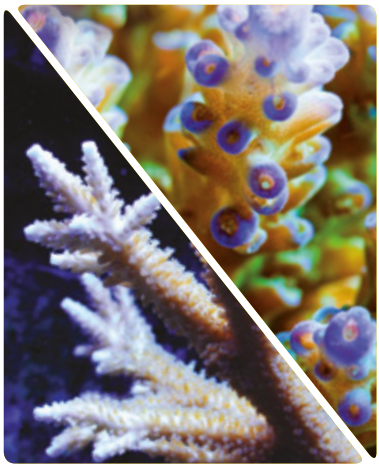


# Enhanced Coloration or Accelerated Growth?

It is widely accepted that there is a narrow spectrum of water conditions that are suitable for keeping corals. Red Sea's research into the long term physiological demands of SPS, LPS & Soft Corals in the reef aquarium has shown that enhanced coloration and accelerated growth require significantly different water conditions.

It is relatively easy to maintain the conditions for accelerated coral growth. Maintaining the conditions for enhanced coloration is more demanding in that it requires a higher level of attention to the water parameters. It is theoretically possible but not recommended to achieve both accelerated growth and advanced coloration simultaneously as the system will always be on the edge of instability.

The complete Reef Care Program provides advanced reef keeping solutions for all levels of hobbyists, with detailed instructions on achieving optimal water parameters for all types of reef aquarium.



## Recommended water parameters for **accelerated coral growth**

| Algae nutrient levels | | |
|---|---|---|
| $NO_3$ | 1-2 ppm | maintaining a relatively high population of Zooxanthellae that will provide enough energy to the corals for growth. |
| $PO_4$ | 0.1 ppm | |

| Foundation elements | | |
|---|---|---|
| Alkalinity | 12.6dKH - 4.5 meq/l | Boosted and balanced levels of the Foundation Elements to properly utilize all of the extra energy. |
| Ca | 465 ppm | |
| Mg | 1390 ppm | |

| Minor and Trace elements - Trace-Colors™ | | |
|---|---|---|
| $I_2$ | 0.06 ppm | Availability of the minor and trace elements (Trace-Colors™) taken up by the corals during growth. |
| K | 410 ppm | |
| Fe | 0.15 ppm | |

| Coral Nutrients - Reef Energy® | | |
|---|---|---|
| Reef Energy® A | 2 ml per 100 Liter/25 gal | Sufficient coral nutrients (Reef Energy®) to supplement the energy supplied by the Zooxanthellae. |
| Reef Energy® B | 2 ml per 100 Liter/25 gal | |

## Recommended Water Parameters For **Enhanced Coloration**

| Algae nutrient levels | | |
|---|---|---|
| $NO_3$ | 0.25 ppm | maintain a reduced level of Zooxanthellae, reducing the brownish tint of the corals and inducing the protection response of enhanced coloration. |
| $PO_4$ | 0.02 ppm | |

| Foundation elements | | |
|---|---|---|
| Alkalinity | 8.2dKH / 2.9meq/L | Reduced levels of the Foundation Elements to lower the energy demand from coral growth. |
| Ca | 430 ppm | |
| Mg | 1310 ppm | |

| Minor and Trace elements - Trace-Colors™ | | |
|---|---|---|
| $I_2$ | 0.06 ppm | Availability of the minor and trace elements (Trace-Colors™) used in the soft tissue for increased coloration. |
| K | 380 ppm | |
| Fe | 0.15 ppm | |

| Coral Nutrients - Reef Energy® | | |
|---|---|---|
| Reef Energy® A | 4 ml per 100 Liter/25 gal | Increased coral nutrients (Reef Energy®) to provide the additional energy that the coral needs to receive from the environment. |
| Reef Energy® B | 4 ml per 100 Liter/25 gal | |

### Aiptasia-X


Guaranteed, Reef-Safe elimination of Aiptasia.

Aiptasia-X is a unique, thick adhesive mixture that globulates on contact with the aquarium water. It is easily injected near to the oral disk of the anemone and stimulates the anemone to ingest the material without causing it to withdraw.

Within minutes of ingesting the Aiptasia-X the anemone will implode, eradicating both the anemone and planulas.

Aiptasia-X globules will not affect the sessile polyps of corals and allows for the safe treatment of Aiptasia that have grown inside coral colonies.

Excess Aiptasia-X will decompose over time without causing any harm to the reef.

Aiptasia-X is available in 60ml (2fl oz) and includes a 3ml applicator with one straight applicator tip, and one curved one for hard-to-get aiptasia.

A 500ml (16.9 fl oz) refill is also available.

# Lighting & Filtration

# T5 Fluorescent Reef Lighting

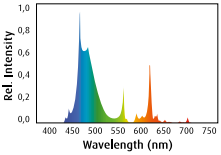

Most corals are photosynthetic and approximately 85% of the energy required for their growth and coloration is provided through the symbiotic relationship they share with the zooxanthellae algae which live within the coral. In order to facilitate the development of the zooxanthellae, it is essential to provide not only the right intensity of lighting (approx. 1w/liter for T5 fluorescents), but to ensure also that the lighting provides the correct color spectrum for corals.

Red Sea's new T5 Reef Lighting range is the result of extensive testing into the needs of corals within a reef aquarium environment. This high quality German-made lighting is proven to provide the intensity and color spectrum required by even the most demanding coral species, commonly known as Small Polyp Stony Corals (SPS). These corals include such species as ***Acropora, Montiopora*** and ***Seriatopora*** and have far more exacting requirements for lighting than soft corals.

Using a combination of Red Sea's T5 fluorescent tubes will not only create a pleasing, natural, visual effect but will also promote coral growth and fluorescence without encouraging the development of undesired algae.

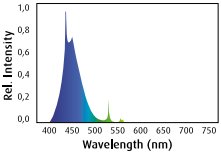
## REEF-SPEC® BlueWhite 15000K

This special color blend (60:40 ratio of 6000K and 22,000K) reproduces the natural lighting conditions of tropical reefs between 1m-20m depth.



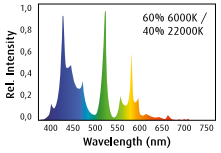

## REEF-SPEC® Actinic 22000K

This special blue and Actinic spectrum mixture is ideal for maximizing the fluorescent coloration of corals.




## REEF-SPEC® Pink

The unique spectrum of the REEF-SPEC® Pink enhances the red, pink and purple colors of SPS and LPS corals.




**Red Sea T5 Reef Lighting**

| Product name | Temp | Color | Wattage | Length | Recommended combination for : | |
|---|---|---|---|---|---|---|
| | | | | | 6 tubes | 10 tubes |
| REEF-SPEC® BlueWhite | 15000K | Blue/White | 24/39/54/80 W | 549/849/1149/1449 mm | 3 | 5 |
| REEF-SPEC® Actinic | 22000K | Actinic/Blue | 24/39/54/80 W | 549/849/1149/1449 mm | 2 | 3 |
| REEF-SPEC® Pink | - | Pink/Purple | 24/39/54/80 W | 549/849/1149/1449 mm | 1 | 2 |

# REEF-SPEC® Carbon

Highly activated carbon for marine & reef aquariums- Red Sea REEF-SPEC® Carbon is the ultimate choice for marine & reef aquariums due to its unique technical characteristics.

Granule size and the micro/macro porous structure ensures a very high total adsorption capacity and rapid extraction of organic pollutants the specific organic pollutants that are found in Reef aquariums. REEF-SPEC® Carbon has extremely low phosphate leaching and minimal ash content while also not affecting the pH of aquarium water.

Red Sea REEF-SPEC® Carbon needs replacing less frequently than carbons that are nor Reef-specific or are of a lower quality and represents an effective, cost-efficient solution for providing the very best water quality in marine & reef aquariums.

**Features:**

- Rapid removal of organic pollutants
- High total adsorption capacity
- Ultra-Low phosphate output
- Ultra-Low ash content
- Suitable for Marine & Freshwater
- Filter Bag included( 250g, 500g)


REEF-SPEC® Carbon is available in 100g, 250g, 500g and 1000g containers.

| Specifications | |
|---|---|
| Shape | 0.6 - 2.3 mm flakes |
| Density | 0.48 g/ml |
| Pore Volume (PV) | 1.04 ml/g |
| Total Surface Area (TSA) | 1000 $m^2/g$ |
| TSA/PV | 990 $m^2/ml$ |
| Small organic molecules adsorption | 1000 mg/g |
| Large organic molecules adsorption | 280 mg/g |
| pH in distilled water | >8 |
| Phosphate output | 0.000001 g/ml |

Red Sea

www.redseafish.com


*North America*

**Red Sea U.S.A & Canada**
4687 World Houston
Parkway #150
Houston, TX 77032
U.S.A
Tel. : +1-888-RED-SEA9
usa.info@redseafish.com

*UK & Ireland*

**Red Sea Aquatics (UK) Ltd**
PO Box 1237
Cheddar, BS279AG
Tel. : +44 (0) 203 3711437
Fax : +44 (0) 800 0073169
uk.info@redseafish.com

*Europe*

**Red Sea Europe**
ZA de la St-Denis
F-27130 Verneuil s/Avre,
France
Tel: (33) 2 32 37 71 37
eur.info@redseafish.com

*Germany & Austria*

**Red Sea Deutschland**
Büro Deutschland
Prinzenallee 7 (Prinzenpark)
40549 Düsseldorf
Tel: 0211-52391 481
info.de@redseafish.com

*Asia Pacific*

**Red Sea Aquatics Ltd**
2310 Dominion Centre
43-59 Queen's Road East
Hong Kong
Tel: +86-020-6625 3828
info.china@redseafish.com

*China*

**Red Sea Aquatics (GZ) Ltd.**
Block A3, No.33 Hongmian Road,
Xinhua Industrial Park,
Huadu District, Guangzhou City,
China, Postal code 510800.
Tel: +86-020-6625 3828
info.china@redseafish.com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