

# REEF ICP TOTAL

**METHODOLOGY:** ICP-OES, photometric and electrochemical methods specific to seawater.

Recommended values are optimized for coral reef aquariums.

**Sample ID:** 20060992

**Analysis ID:** 166511

Sample Type: Seawater

Volume in Liters: 500

Sampling Point: Aquarium 1

Sampling Date: 09-29-2024

Sample Arrival: 10-07-2024

[To the dosing and action recommendations](#)



## PHYSICAL-CHEMICAL BASIC VALUES

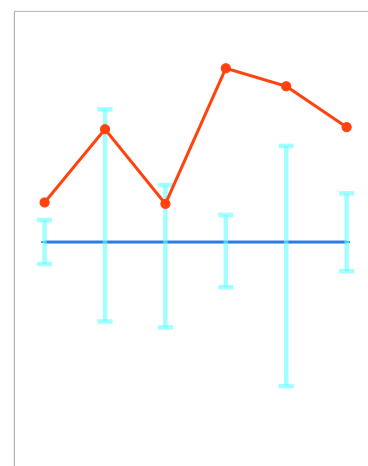
|                                      | measured | Reference Range       |
|--------------------------------------|----------|-----------------------|
| Electrical Conductivity (mS/cm 25°C) | 55.6     | 51,7 - 53,0 - 54,5    |
| Density (kg/Liter, calculated 25°C)  | 1.025    | 1,022 - 1,023 - 1,024 |
| Relative Density (calculated 25°C)   | 1.028    | 1,026 - - - 1,027     |
| Salinity (psu, calculated)           | 36.8     | 34 - 35 - 36          |
| pH Value                             | 8.05     | 7,9 - 8,3 - 8,4       |
| Carbonate Hardness (°dKH)            | 8.6      | 6,5 - 7,3 - 8,5       |
| CO2 Content (mg/l)                   | 2.23     | 0,04 - - - 2,5        |
| Alkalinity pH 4.3 (mmol/L)           | 3.07     | 2,3 - 2,58 - 3,0      |
| Smell                                | none     | none                  |
| Color                                | none     | colorless             |

## MACROELEMENTS, CALCIUM BALANCE ELEMENTS, AND HALOGENS in mg/Liter

|                                  |                               | measured | Reference Range       | rel. 35 psu |
|----------------------------------|-------------------------------|----------|-----------------------|-------------|
| Sodium                           | Na                            | 11478    | 9500 - 10700 - 11500  | 10903       |
| Sulfur                           | S                             | 886      | 850 - 900 - 950       | 842         |
| Sulfate                          | SO <sub>4</sub> <sup>2-</sup> | 2654     | 2550 - 2700 - 2850    | 2522        |
| Potassium                        | K                             | 454      | 380 - 395 - 420       | 431         |
| Boron                            | B                             | 6.69     | 3,8 - 4,5 - 5,5       | 6.35        |
| Magnesium                        | Mg                            | 1417     | 1200 - 1350 - 1450    | 1346        |
| Calcium                          | Ca                            | 521      | 400 - 425 - 440       | 495         |
| Strontium                        | Sr                            | 9.62     | 6,5 - 8,0 - 9,0       | 9.14        |
| Chloride                         | Cl <sup>-</sup>               | 20395    | 18700 - 19500 - 20300 | 19374       |
| Bromine (total bromine, ICP-OES) | Br                            | 75.1     | 55 - 67 - 75          | 71.3        |
| Fluoride                         | F <sup>-</sup>                | 1.43     | 0,9 - 1,3 - 1,6       | 1.36        |
| Iodine (Total Iodine, ICP-OES)   | I                             | 0.158    | 0,055 - 0,065 - 0,080 | 0.15        |

## RELATION VALUES OF MACROELEMENTS AND HALOGENS

|                               |                                                | measured | Reference Range    |
|-------------------------------|------------------------------------------------|----------|--------------------|
| Salinity Meas. : Target Value | Sal.                                           | 1.05     | 0,97 - 1,00 - 1,03 |
| KH Measurement : Target Value | KH                                             | 1.19     | 0,90 - 1,00 - 1,17 |
| Magnesium : Salinity          | Mg                                             | 38.5     | 33,3 - 38,6 - 42,6 |
| Calcium : Salinity            | Ca                                             | 14.1     | 11,1 - 12,1 - 12,9 |
| Strontium: Salinity           | Sr                                             | 0.26     | 0,18 - 0,23 - 0,26 |
| Potassium : Salinity          | K                                              | 12.3     | 10,6 - 11,3 - 12,4 |
| Boron : Salinity              | B                                              | 0.18     | 0,11 - 0,13 - 0,16 |
| Chloride : Salinity           | Cl <sup>-</sup>                                | 554      | 519 - 557 - 597    |
| Sulfate : Salinity            | SO <sub>4</sub> <sup>2-</sup>                  | 72       | 71 - 77 - 84       |
| Chloride : Sulfate            | Cl <sup>-</sup> /SO <sub>4</sub> <sup>2-</sup> | 7.68     | 6,6 - 7,2 - 8,0    |
| Magnesium : Calcium           | Mg/Ca                                          | 2.72     | 2,7 - 3,2 - 3,6    |
| Calcium : Strontium           | Ca/Sr                                          | 54.2     | 44 - 53 - 68       |
| Bromide : Fluoride            | Br <sup>-</sup> /F <sup>-</sup>                | 52.5     | 34 - 52 - 83       |
| Fluoride : Iodine             | F <sup>-</sup> /I                              | 9.1      | 11 - 20 - 29       |
| Fluoride : Sulfur : Strontium | FSS                                            | 95.3     | 80 - 100 - 120     |

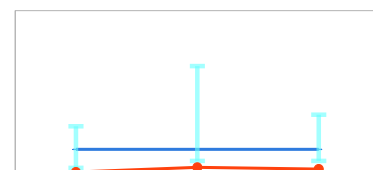


Sal. KH Mg Ca Sr K

— Ideal Line  
— Relation Values

## MACRO NUTRIENTS in mg/Liter

|                               |                                               | measured | Reference Range |
|-------------------------------|-----------------------------------------------|----------|-----------------|
| Nitrate                       | NO <sub>3</sub> <sup>-</sup>                  | 0.1      | 1 - 10          |
| Nitrite                       | NO <sub>2</sub> <sup>-</sup>                  | n.d.     | < 0,20          |
| Phosphorus (ICP-OES)          | P                                             | 0.003    | < 0,06          |
| Total Phosphate (calculated)  | PO <sub>4</sub> <sup>3-</sup> <sub>tot.</sub> | 0.009    | 0,02 - 0,18     |
| ortho-Phosphate (photometric) | PO <sub>4</sub> <sup>3-</sup>                 | 0.006    | 0,02 - 0,10     |
| Silicon                       | Si                                            | 0.08     | 0,1 - 0,2       |
| Silicate (calculated)         | SiO <sub>2</sub>                              | 0.18     | 0,2 - 0,4       |



NO3- PO43-tot. PO43-

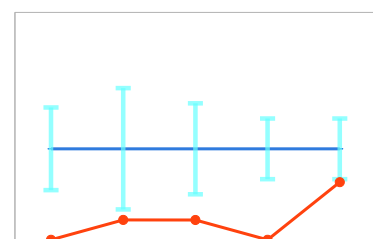
— Ideal Line  
— Measurement Values

## ORGANIC FACTORS

|                                   |                                                                              | measured | Reference Range |
|-----------------------------------|------------------------------------------------------------------------------|----------|-----------------|
| Total Phosphate : Nitrate         | PO <sub>4</sub> <sup>3-</sup> <sub>tot.</sub> /NO <sub>3</sub> <sup>-</sup>  | 10.87    | 90 - 110        |
| Total Phosphate : ortho-Phosphate | PO <sub>4</sub> <sup>3-</sup> <sub>tot.</sub> /PO <sub>4</sub> <sup>3-</sup> | 1.5      | 1,00            |
| Total Phosphate : Iodine          | PO <sub>4</sub> <sup>3-</sup> <sub>tot.</sub> /I                             | 0.06     | 0,13 - 1,67     |
| SAK254 (m <sup>-1</sup> )         |                                                                              | 0.4      | 0,5 - 5,0       |

## Dynamic Elements in µg/Liter

|            |    | measured | Reference Range |
|------------|----|----------|-----------------|
| Zinc       | Zn | n.d.     | 3 - 5,5 - 8     |
| Vanadium   | V  | 1.31     | 2 - 6 - 10      |
| Copper     | Cu | 0.87     | 2 - 4 - 6       |
| Nickel     | Ni | n.d.     | 3 - 4,5 - 6     |
| Molybdenum | Mo | 9.5      | 10 - 15 - 20    |

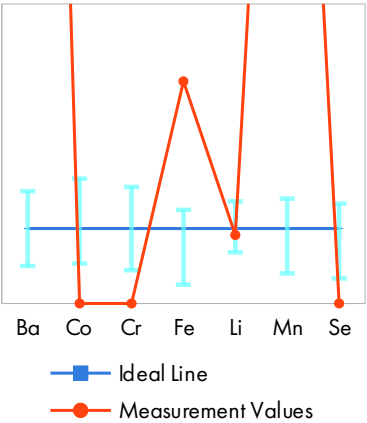


Zn V Cu Ni Mo

— Ideal Line  
— Measurement Values

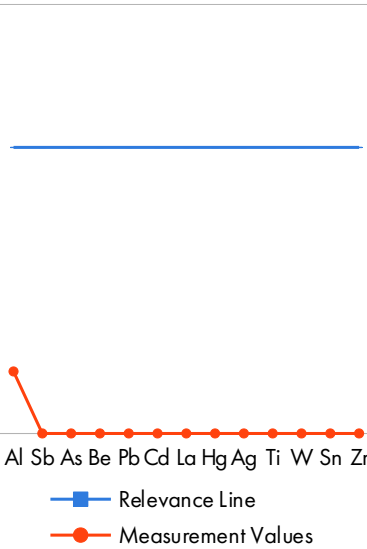
PHYSIOLOGICALLY RELEVANT TRACE ELEMENTS in µg/Liter

|           |    | measured | Reference Range |   |      |
|-----------|----|----------|-----------------|---|------|
|           |    |          |                 |   | Max. |
| Barium    | Ba | 228      | 5               | - | 50   |
| Cobalt    | Co | n.d.     | n.d.            | - | 1,9  |
| Chromium  | Cr | n.d.     | n.d.            | - | 2,3  |
| Iron      | Fe | 5.93     | n.d.            | - | 2,5  |
| Lithium   | Li | 201      | 180             | - | 350  |
| Manganese | Mn | 1.32     | n.d.            | - | 0,25 |
| Selenium  | Se | n.d.     | n.d.            | - | 2,0  |



OTHER TRACE ELEMENTS AND POTENTIAL POLLUTANTS in µg/Liter

|           |    | measured | Reference Range |          |     |
|-----------|----|----------|-----------------|----------|-----|
| Aluminum  | Al | 6.5      | 5               | -        | 30  |
| Antimony  | Sb | n.d.     | n.d.            | - (max.) | 10  |
| Arsenic   | As | n.d.     | n.d.            |          |     |
| Beryllium | Be | n.d.     | n.d.            |          |     |
| Lead      | Pb | n.d.     | n.d.            |          |     |
| Cadmium   | Cd | n.d.     | n.d.            |          |     |
| Lanthanum | La | n.d.     | 2               | -        | 10  |
| Mercury   | Hg | n.d.     | n.d.            |          |     |
| Silver    | Ag | n.d.     | n.d.            | - (max.) | 10  |
| Titanium  | Ti | n.d.     | n.d.            | -        | 3,5 |
| Tungsten  | W  | n.d.     | n.d.            | - (max.) | 30  |
| Tin       | Sn | n.d.     | n.d.            | - (max.) | 10  |
| Zirconium | Zr | n.d.     | n.d.            | -        | 2,2 |



# OSMOSIS WATER

| in mg/Liter                      |                                    | measured | Reference Range |
|----------------------------------|------------------------------------|----------|-----------------|
| Calcium                          | Ca                                 | n.d.     | n.d.            |
| Potassium                        | K                                  | n.d.     | n.d.            |
| Magnesium                        | Mg                                 | n.d.     | n.d.            |
| Sodium                           | Na                                 | 0.6      | n.d.            |
| Sulfur                           | S                                  | n.d.     | n.d.            |
|                                  |                                    |          |                 |
| Bromine (total bromine, ICP-OES) | Br                                 | n.d.     | n.d.            |
| Iodine (Total Iodine, ICP-OES)   | I                                  | n.d.     | n.d.            |
|                                  |                                    |          |                 |
| Phosphorus (ICP-OES)             | P                                  | n.d.     | n.d.            |
| Total Phosphate (calculated)     | PO <sub>4</sub> <sup>3-</sup> tot. | n.d.     | n.d.            |
| Silicon                          | Si                                 | 0.03     | n.d.            |
| Silicate (calculated)            | SiO <sub>2</sub>                   | 0.06     | n.d.            |
|                                  |                                    |          |                 |
| in µg/Liter                      |                                    |          |                 |
| Aluminum                         | Al                                 | n.d.     | n.d.            |
| Antimony                         | Sb                                 | n.d.     | n.d.            |
| Arsenic                          | As                                 | n.d.     | n.d.            |
| Barium                           | Ba                                 | n.d.     | n.d.            |
| Beryllium                        | Be                                 | n.d.     | n.d.            |
| Lead                             | Pb                                 | n.d.     | n.d.            |
| Boron                            | B                                  | n.d.     | n.d.            |
| Cadmium                          | Cd                                 | n.d.     | n.d.            |
| Chromium                         | Cr                                 | n.d.     | n.d.            |
| Cobalt                           | Co                                 | n.d.     | n.d.            |
| Iron                             | Fe                                 | n.d.     | n.d.            |
| Copper                           | Cu                                 | n.d.     | n.d.            |
| Lanthanum                        | La                                 | n.d.     | n.d.            |
| Lithium                          | Li                                 | n.d.     | n.d.            |
| Manganese                        | Mn                                 | 0.5      | n.d.            |
| Molybdenum                       | Mo                                 | n.d.     | n.d.            |
| Nickel                           | Ni                                 | n.d.     | n.d.            |
| Mercury                          | Hg                                 | n.d.     | n.d.            |
| Selenium                         | Se                                 | n.d.     | n.d.            |
| Silver                           | Ag                                 | n.d.     | n.d.            |
| Strontium                        | Sr                                 | n.d.     | n.d.            |
| Titanium                         | Ti                                 | n.d.     | n.d.            |
| Thallium                         | Tl                                 | n.d.     | n.d.            |
| Vanadium                         | V                                  | n.d.     | n.d.            |
| Tungsten                         | W                                  | n.d.     | n.d.            |
| Tin                              | Sn                                 | n.d.     | n.d.            |
| Zinc                             | Zn                                 | n.d.     | n.d.            |
| Zirconium                        | Zr                                 | n.d.     | n.d.            |

**Abbreviations:** ICP-OES (inductively coupled plasma with optical emission spectrometry), SAK254 (spectral absorption coefficient at 254 nm), n.m. (not measured), n.d. (not detectable).