REEF ICP **TOTAL**

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

Recommended values are optimized for coral reef aquariums.

Sample ID:	**20457761**
Analysis ID:	**160289**
Sample Type:	Seawater
Volume in Liters:	600
Sampling Point:	Peninsula Style
Sampling Date:	09-02-2024
Sample Arrival:	09-06-2024

To the dosing and action recommendations

PHYSICAL-CHEMICAL BASIC VALUES

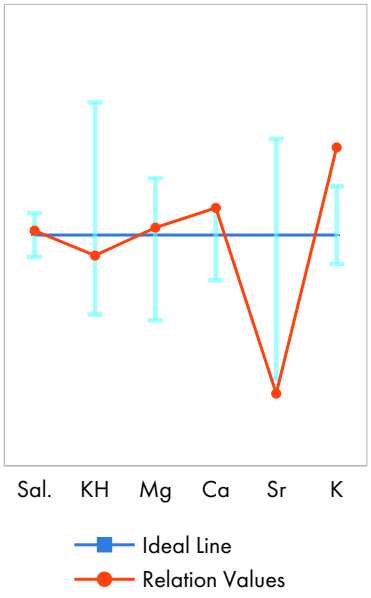
	measured	Reference Range
Electrical Conductivity (mS/cm 25°C)	**53.4**	51,7 - 53,0 - 54,5
Density (kg/Liter, calculated 25°C)	**1.024**	1,022 - 1,023 - 1,024
Relative Density (calculated 25°C)	**1.027**	1,026 - 1,027
Salinity (psu, calculated)	**35.2**	34 - 35 - 36
pH Value	**8.1**	7,9 - 8,3 - 8,4
Carbonate Hardness (°dKH)	**7.3**	6,5 - 7,3 - 8,5
CO2 Content (mg/l)	**1.68**	0,04 - 2,5
Alkalinity pH 4.3 (mmol/L)	**2.61**	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	**11156**	9500 - 10700 - 11500	**11088**
Sulfur	S	**875**	850 - 900 - 950	**870**
Sulfate	SO_4^{2-}	**2622**	2550 - 2700 - 2850	**2606**
Potassium	K	**440**	380 - 395 - 420	**437**
Boron	B	**6.17**	3,8 - 4,5 - 5,5	**6.13**
Magnesium	Mg	**1363**	1200 - 1350 - 1450	**1355**
Calcium	Ca	**440**	400 - 425 - 440	**437**
Strontium	Sr	**6.35**	6,5 - 8,0 - 9,0	**6.31**
Chloride	Cl^-	**19493**	18700 - 19500 - 20300	**19374**
Bromine (total bromine, ICP-OES)	Br	**80.4**	55 - 67 - 75	**79.9**
Fluoride	F^-	**0.61**	0,9 - 1,3 - 1,6	**0.61**
Iodine (Total Iodine, ICP-OES)	I	**0.069**	0,055 - 0,065 - 0,080	**0.069**

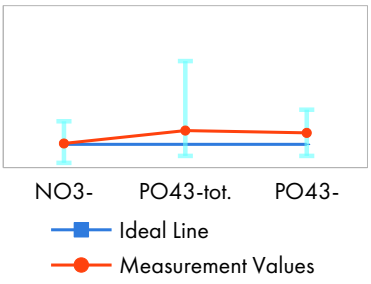
RELATION VALUES OF MACROELEMENTS AND HALOGENS

		measured	Reference Range
Salinity Meas. : Target Value	Sal.	**1.01**	0,97 - 1,00 - 1,03
KH Measurement : Target Value	KH	**1.01**	0,90 - 1,00 - 1,17
Magnesium : Salinity	Mg	**38.7**	33,3 - 38,6 - 42,6
Calcium : Salinity	Ca	**12.5**	11,1 - 12,1 - 12,9
Strontium: Salinity	Sr	**0.18**	0,18 - 0,23 - 0,26
Potassium : Salinity	K	**12.5**	10,6 - 11,3 - 12,4
Boron : Salinity	B	**0.18**	0,11 - 0,13 - 0,16
Chloride : Salinity	Cl^-	**554**	519 - 557 - 597
Sulfate : Salinity	SO_4^{2-}	**74.4**	71 - 77 - 84
Chloride : Sulfate	Cl^-/SO_4^{2-}	**7.44**	6,6 - 7,2 - 8,0
Magnesium : Calcium	Mg/Ca	**3.1**	2,7 - 3,2 - 3,6
Calcium : Strontium	Ca/Sr	**69.3**	44 - 53 - 68
Bromide : Fluoride	Br^-/F^-	**131.8**	34 - 52 - 83
Fluoride : Iodine	F^-/I	**8.8**	11 - 20 - 29
Fluoride : Sulfur : Strontium	FSS	**66.9**	80 - 100 - 120



MACRO NUTRIENTS in mg/Liter

		measured	Reference Range
Nitrate	NO_3^-	**5.2**	1 - 10
Nitrite	NO_2^-	**0.1**	< 0,20
Phosphorus (ICP-OES)	P	**0.021**	< 0,06
Total Phosphate (calculated)	$PO_4^{3-}{}_{tot.}$	**0.064**	0,02 - 0,18
ortho-Phosphate (photometric)	PO_4^{3-}	**0.06**	0,02 - 0,10
Silicon	Si	**0.07**	0,1 - 0,2
Silicate (calculated)	SiO_2	**0.15**	0,2 - 0,4

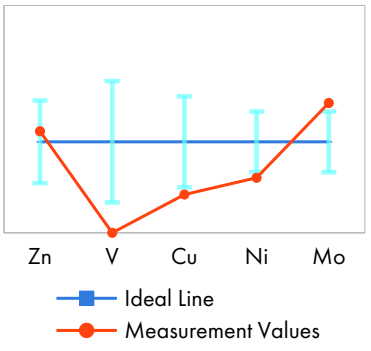


ORGANIC FACTORS

		measured	Reference Range
Total Phosphate : Nitrate	$PO_4^{3-}{}_{tot.}/NO_3^-$	**80.3**	90 - 110
Total Phosphate : ortho-Phosphate	$PO_4^{3-}{}_{tot.}/PO_4^{3-}$	**1.067**	1,00
Total Phosphate : Iodine	$PO_4^{3-}{}_{tot.}/I$	**0.93**	0,13 - 1,67
SAK254 (m^{-1})		**0.7**	0,5 - 5,0

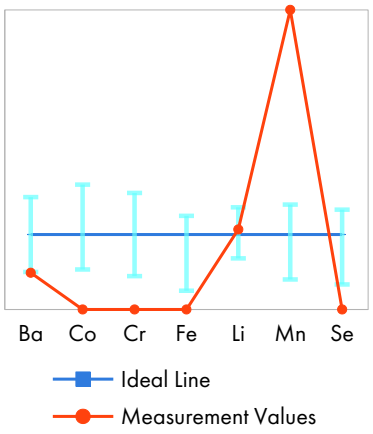
Dynamic Elements in µg/Liter

		measured	Reference Range
Zinc	Zn	**6.14**	3 - 5,5 - 8
Vanadium	V	**n.d.**	2 - 6 - 10
Copper	Cu	**1.68**	2 - 4 - 6
Nickel	Ni	**2.72**	3 - 4,5 - 6
Molybdenum	Mo	**21.4**	10 - 15 - 20



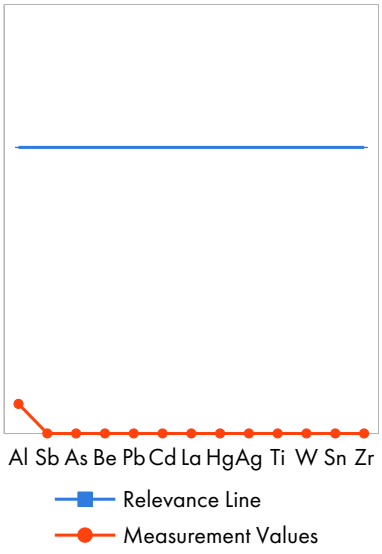
PHYSIOLOGICALLY RELEVANT TRACE ELEMENTS in µg/Liter

		measured	Reference Range		
					Max.
Barium	Ba	**4.9**	5	-	50
Cobalt	Co	**n.d.**	n.d.	-	1,9
Chromium	Cr	**n.d.**	n.d.	-	2,3
Iron	Fe	**n.d.**	n.d.	-	2,5
Lithium	Li	**235**	180	-	350
Manganese	Mn	**0.4**	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	**3.1**	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	**n.d.**	**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_4^{3-} tot.	**n.d.**	**n.d.**
Silicon	Si	**n.d.**	**n.d.**
Silicate (calculated)	SiO_2	**n.d.**	**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	**n.d.**	**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).