

Phosphate in Sea Water



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Many fishes must be well fed. Therefore high phosphate concentrations will occur. picture: Othmar Pötsch

Phosphate – an important nutrient

Phosphate is an essential nutrient that needs every organism. Without phosphorus - a part of phosphate - any phospho-lipids will be build. This substances are very important for cell membranes. The DNA contains high phosphorous concentration, too. Phosphorous is build in the main parts of proteins and enzymes. The energy of a cell is controlled by phosphorous containing substances, called ATP (adenosine tri phosphate). So in all biochemical processes phosphorous is very important.

In natural reefs the animals have different source to get phosphorous. Dissolved phosphate is only in very low concentrations in the water - this source is not important! Most phosphorous is bounded in the plankton. Corals catch this plankton and takes the phosphorous and other substances like nitrogen, trace elements and energy.

In Aquaria there is very less plankton and corals are not able to take this source. Dissolved Phosphate is the main source for these animals. Fishes gets their phosphorous with the food - in the sea and in the aquarium.

Dangers with phosphate

If there is too less phosphate in the aquarium water very sensitive animals like *Tridacna* or *Acropora* will stop growing and in the worst case they will die. If there is too much phosphate in the water animals will die, too. The optimum concentration for sea water aquaria is between 0,05 to 0,20 mg/l (ppm) phosphate. But in this interval even good aquaristic tests are not sensible. So it is better to take a water sample two times per year and go to a lab or a good marine animal shop to control the phosphate concentration. For big aquaria a photometer is a good instrument to control the water values.

Phosphate concentrations above 0,20 mg/l are able to destroy the sensible biological balance in the aquarium. Too much phosphate causes a strong growth of green and blue green algae. These algae are able to grow on the animals and kill them. Even the algae in corals - called zooxanthella - will grow very fast and the corals gets problems. The animal takes out the algae and the animal bleaches. Bleached corals are extremely sensitive and will decease very fast.



Hard corals are dying within 1-2 days, if the living conditions are bad. High phosphate concentrations are one reason for coral decease.

At high phosphate concentrations - especially in combination with high nitrate concentrations - hard corals reacts very sensitive to additionally bad conditions like wrong or too week light (see picture)

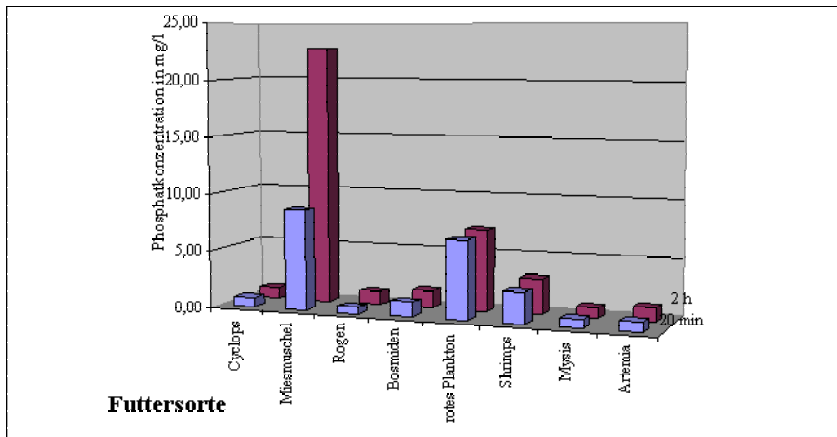
Phosphate in the food

The source of phosphate in the aquarium is only the input of food if other factors are eliminated. All sea water products should be of a very high quality. It is important that only phosphate free water is used (reverse osmosis technique); sea salt, phosphate free activated carbon, phosphate free granules for chalk reactors and safe care products are necessary.

The problem of the food still remains. Food is made of natural substances that contains phosphate.

AquaCare experiments show the different concentrations of phosphate in food.

picture: phosphate concentrations in the ice water (100 ml) per gram food



The picture shows that some food leaches high concentrations of phosphate into the ice water. You will see it especially at mussels "Miesmuschel" and red plankton ("rotes Plankton"). Food with high concentrations of phosphate in ice water should be fed only seldom.

How to prevent high phosphate concentrations?

The question still remains: how to prevent high phosphate concentrations. To feed less is the worst solution. If fishes are not fed very good they get aggressive against others, they will get ill very fast and they are sensible against parasites.

Preparing the frost food is one of the main factor to prevent high phosphate concentrations. Only use the frosted animals - do not use the ice water (if you have phosphate concentrations below 0,05 mg/l use the ice water, too). If you feed quality food not too much vitamins and other nutrients will be spoiled with the ice water. If the defrosted food has dark ice water choose another food deliverer!

A regularly made water change is another way to prevent very high phosphate concentrations. The higher the phosphate concentrations the more water change is necessary. But the fresh sea water for the water change must be free of phosphate. Therefore use only phosphate free water and a quality sea salt.

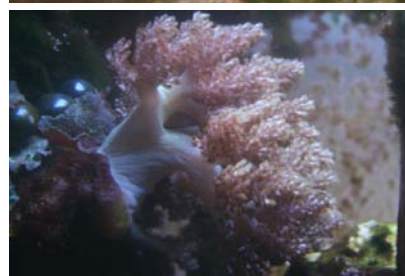
An additional fact for preventing too high phosphate inputs is a good working protein skimmer. The more effectiv the skimmer the less phosphat will come into the water. Pro-

teins that are not taken out by a skimmer will be degraded by bacteria. During this process phosphat will accumulate.

Dosing of ozone will enforce the

skimmer efficiency.

Nicht zu unterschätzen sind die natürlichen Senken durch **photoautotrophe Organismen**; zu dieser Gruppe gehören insbesondere die zooxanthellaten Korallen als auch Algen. Da das Wachstumsrate direkt von der zur Verfügung stehenden Lichtmenge abhängig ist, kann durch die Installierung einer helleren Beleuchtung das Wachstum der Tiere erhöht werden – gleichzeitig geht unerwünschtes Schmieralgenwachstum zurück.



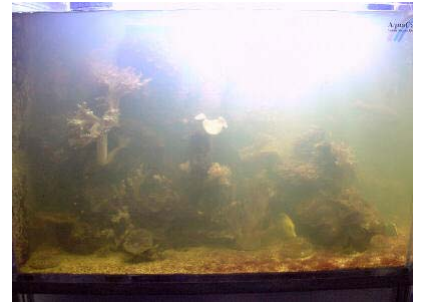
Genetisch gleiche Tiere (*Capnella spec.*) bei schwacher Beleuchtung (oben) und erheblich mehr Licht (unten). Bei intensiverer Beleuchtung können die Tiere schneller und kräftiger wachsen; dabei nehmen sie mehr Nitrat und Phosphat aus dem Wasser auf.
Foto: AquaCare

How to eliminate phosphate?

If too much phosphate is in the aquarium, it should be get out very fast to prevent damages at the animals. There are two methods:

Scaling.

On the market are some products for scaling phosphate. The AquaCare product Phosphate-minus reacts with the same principle. If the product gets into the water the containing chemicals precipitate phosphate to strong bounded substances that will be skimmed or filtered in sediment filters. You can see this process at the turbid water.



Phosphate-minus with 5 times more than the normal concentration. 4 *Zebrosoma flavescens*, 1 *Ctenochaetes striatus* and all other animals do not show bad reactions. Only the fishes were a little bit shy because the water is very turbid.

With all precipitation products is a danger of loosing surgeons.

The turbidity will get away very fast, because the precipitate will be skimmed and filtered. In aquaria with low currents the precipitate will settle down in the sediment. The phosphate is bounded very strong and if the ground is cleaned regularly algae will not get this phosphate precipitates. If phosphate is in the water since a long time the dosing must be repeated because fresh orthophosphate will get out of phosphate pools. If you use theses products regularly the phosphate concentration should go down to good concentrations. If you use Phosphate-minus from AquaCare you must be sure that the KH is over 7°dH. Otherwise animals will be damaged with the strong pH and redox (ORP) oscillations. Sensitive animals like *Zebrosoma* or *Acanthurus* reacts very fast if the KH is below 7. Before dosing Phosphate-minus you must measure KH and if it is too less dose KH-plus, Triple-Buffer or raise the output of the chalk reactor. A good current disperses the product very fast.

The "Kalkwasser" method eliminates phosphate, too. At the place of drop

in the calcium hydroxide solution has a very high pH and reacts with the phosphate to a precipitate. The dosing of calcium hydroxide water will be done automatically with a "Kalkwasser" reactor / mixer.

Adsorber:

the second method is the adsorption of phosphate. There are some filter media that adsorb phosphate. The material should be driven in a bypass not in the main filter stream.

In the future you will read more at this space.