

Claude Schuhmacher at his coral farm, Fauna Marin.

# The Bolus Method

## INTERVIEW WITH CLAUDE SCHUHMACHER, FAUNA MARIN

Marine aquaristics thrives on the development and refinement of new methods and techniques aimed at further improving success in keeping corals and fishes. The Bolus Method is one such approach.

**CORAL:** Hello, Claude. Thank you very much for the opportunity to discuss the development of the Bolus Method with you. Could you please briefly introduce yourself and your company, Fauna Marin, to our readers?

**Claude Schuhmacher (CS):** With pleasure! Fauna Marin is one of the leading manufacturers of dosing systems, foods, and accessories for marine aquariums. I founded the company in 2001, after having been active in marine aquaristics since 1985. My career began working in wholesale and retail in Magstadt, Germany. After moving to a large specialty company near Stuttgart and working on large aquarium installations, I began preparing for what would be Fauna Marin.

In the Philippines, we established an export facility and trained local fishers in new techniques. After setting up coral and clam farms, as well as a fully operational export station, I returned to Germany to establish Fauna Marin. The goal was to offer modern coral propagation, food production,

FAUNA MARIN

and complete dosing systems. In 2012, we expanded our services to include laboratory analysis. Previously, we had collaborated with several universities on sponge and clam breeding projects, gaining valuable experience in analytical work.

Today, the Fauna Marin laboratory operates globally and serves not only 30,000 lab clients but also professional institutions such as the Horniman Museum in London, large aquariums like the Vivarium Karlsruhe, and Burgers' Zoo in the Netherlands. With approximately 500 water samples processed daily, Fauna Marin is among the world's largest providers of specialized water analysis for aquariums and seawater. We offer detailed testing for up to 100 water parameters. A team of seven staff members from chemistry and biology fields forms the core of the lab department, while experienced aquarists interpret the results and provide consultation.

Thanks to state-of-the-art lab equipment and AI-assisted software, every customer receives personalized dosing instructions, predictions of potential problems, and specific recommendations for managing their aquarium. In addition to macroelements and salinity, we also analyze micro- and trace elements, halogens, and organic parameters. Customers can also opt for additional tests such as ICP-MS for ultra-trace element analysis.

Our coral farm, rebuilt in 2006, consists of fiberglass-reinforced plastic raceways with a total volume of approximately 5,300 gallons (20,000 L), distributed across seven separate systems for small-polyp stony (SPS) corals, large-polyp stony (LPS) corals, quarantine, and propagation. We were one of the first companies to offer WYSIWYG (What You See Is What You Get) corals through our online shop. Today, we propagate up to 95 percent of all the corals we sell ourselves. For the past two years, the farm has been operating using the Bolus Method.

**CORAL:** What exactly is the Bolus Method?

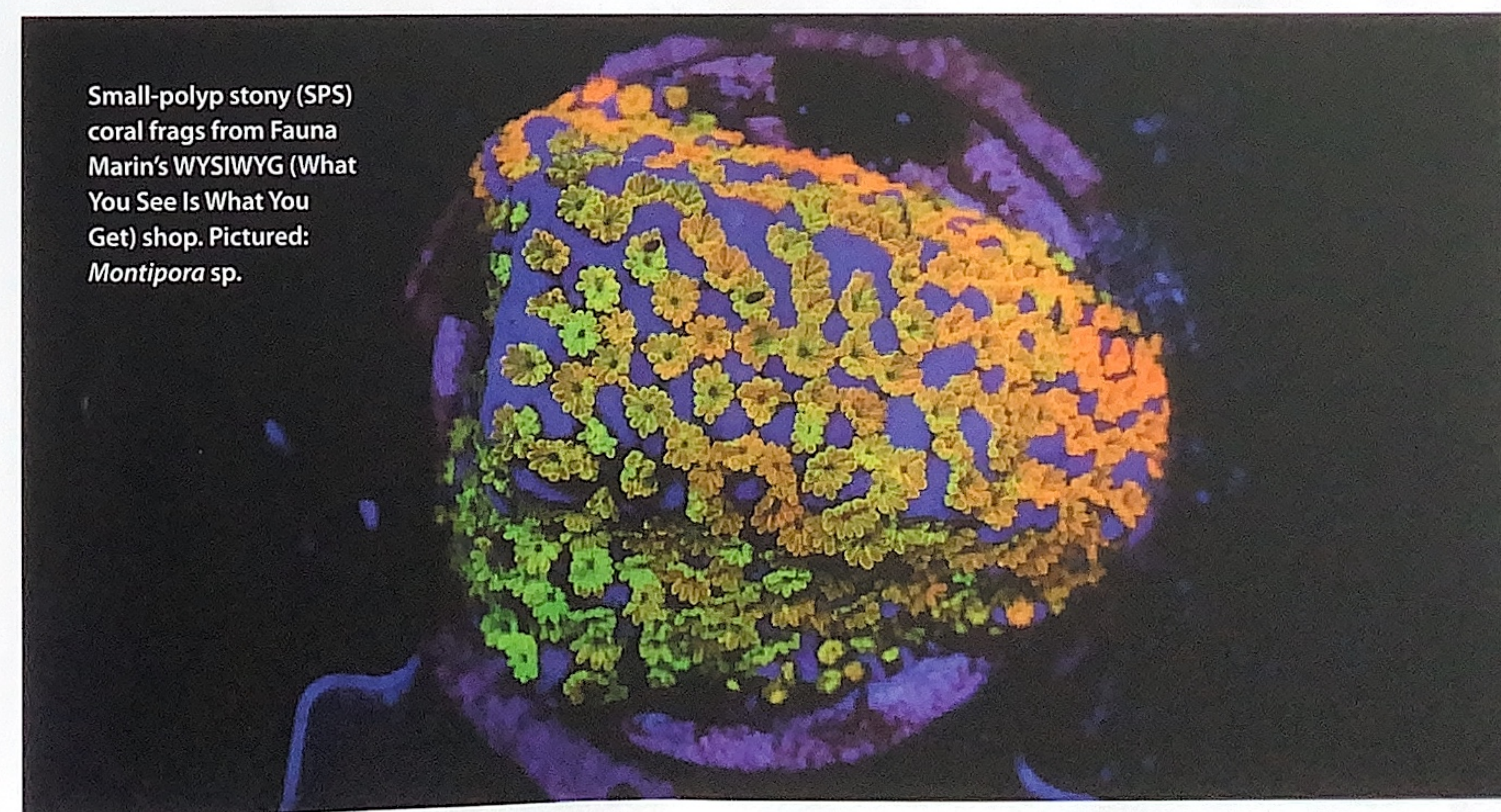
**CS:** The fundamentals of the Bolus method are to dose the entire daily requirement of Fauna Marin *Balling Light KH* in a single dose 30 minutes before the start of the photoperiod; this single dose is known as the Bolus. The goal is to maintain the aquarium's pH level as close to 8.2 as possible before the start of the photoperiod. This level is a significant threshold at which many processes inside the coral begin to function optimally, such as coral growth (calcification) and photosynthesis (chemical energy production by the symbiotic algae). With *Balling Light KH*, it's possible to raise the pH in advance—before the light phase begins—by administering the entire daily dose of the carbonate solution in a single application. The timing of this dose is crucial for several reasons and should occur about 30 minutes before the light period begins.

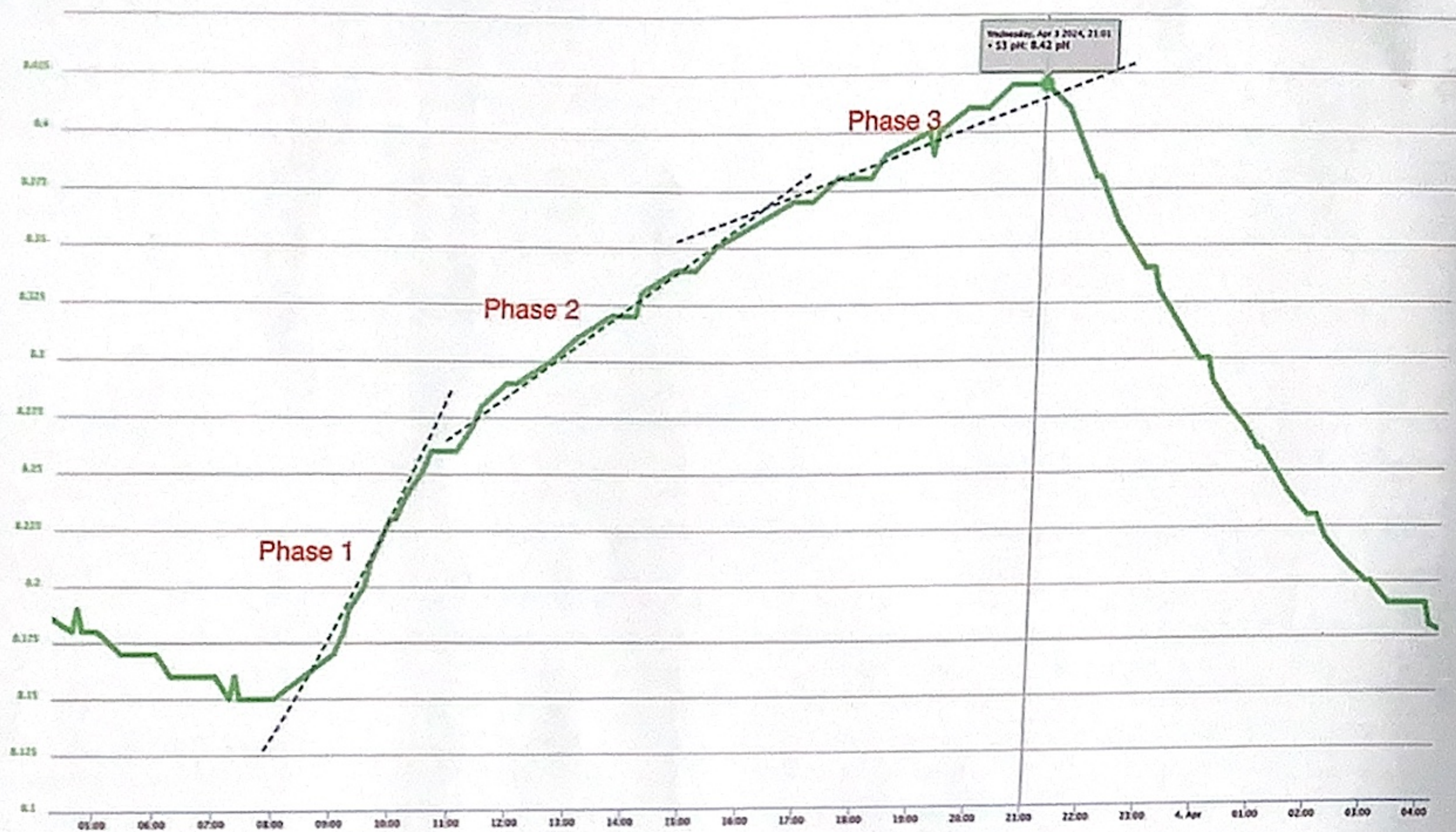
The Bolus Method is a specific dosing variation of the *Balling Light Method*, in which carbonate is supplied once daily. The term we use for this is "Bolus." It comes from the medical field (from Latin for "shot" or "lump") and refers to the rapid administration of a drug or substance to raise its concentration to an effective dose. Accordingly, an appropriate dosage of our *Balling Light KH* solution improves the stability of carbonate hardness, the carbonate buffer system, and the pH level. At the same time, it prevents the accumulation of nutrients and elements on surfaces and reduces the long-term risk of Old Tank Syndrome.

**CORAL:** How is the method applied and monitored?

**CS:** The method requires a single daily dose of sodium bicarbonate before the lights are turned on. It is ideally

Small-polyp stony (SPS) coral frags from Fauna Marin's WYSIWYG (What You See Is What You Get) shop. Pictured: *Montipora* sp.





Three-phase daily pH profile with application of the Bolus Method: The Bolus is dosed shortly before Phase 1 begins. In Phase 1, the lights ramp up to the selected maximum intensity. The pH rises quickly, and a corresponding carbonate balance is established. Phase 2 is the phase of peak photosynthesis. In the preceding Phase 1, large amounts of carbonic acid and CO<sub>2</sub> are produced, now available for efficient photosynthesis. The pH increase slows, and a new carbonate balance forms to generate more carbonate for Phase 3. In Phase 3, calcification increases. The pH rises more slowly, but carbonate hardness declines more rapidly. Many well-balanced reef aquariums may reach a peak pH of 8.4 or higher.

suited for the Balling Light Method, as the addition of trace elements and halogens further enhances its effectiveness.

First, calculate the full 24-hour dose of *Balling Light KH*, which is normally distributed throughout the day. This entire amount is then administered as a single dose, 30 minutes before the light period begins. For example, if the photoperiod starts at 9:00 A.M., then the alkalinity solution must be dosed at 8:30 A.M.

The calcium dosing, which we recommend dividing into 8–10 doses throughout the entire light phase, should begin one hour after the alkalinity dose. With the Bolus Method, it is important to maintain the calcium level within the range of 400–435 ppm, and the KH (carbonate hardness) should be between 7–9 dKH before starting the method. If the calcium concentration rises above 440 ppm, the precipitation rate of calcium carbonate increases.

Magnesium can be dosed as usual over a 24-hour period and should be maintained between 1,300–1,450 ppm. Additionally, it is advisable to postpone the addition of any substances that could negatively affect the pH level until later in the day—ideally during the dark phase—so as not to interfere with the Bolus chemistry. This includes, for example, dosing carbon sources or lanthanum chloride. The alkalinity dose should be administered into the final chamber of the sump—i.e., the chamber with the return pump. If no

sump is used, it's recommended to dose in an area with strong water flow.

The alkalinity solution can be dosed either manually or with a dosing pump. The only important point is to ensure there's a one-hour gap between the Bolus dose and the calcium and magnesium dosing.

I'd also like to stress once more that when using the Bolus Method, no other dosing product should be used that could interfere with the carbonate/calcium system. This includes additives based on carbonate, formate, or hydroxide, or the use of calcium reactors. For example, using kalkwasser with the Bolus Method would almost certainly end in disaster.

**CORAL:** How does the tank's lighting system now come into play?

**CS:** The light phase must be adjusted to a profile we call "Solus", which in our view mimics the natural light profile of coral reefs. In this approach, the lighting units are either turned on immediately or with only a very short delay of 10 minutes to the maximum intensity at which the aquarium is operated. This intense light burst, which should initially last 30 minutes to 2 hours depending on the aquarium, is crucial at the beginning of the photoperiod to strongly stimulate photosynthesis in conjunction with the Bolus.

The color spectrum of the light also plays an important role. At the start of the light phase, the intensity of the white channels should be set to 20 percent above the normal level, while the intensity of the blue channels can remain unchanged. Once the aquarium has adapted to this lighting scheme, this Solus phase can be extended over several days until it ultimately lasts 2–3 hours. After the Solus phase ends, the lighting profile can be returned to the desired custom settings.

As mentioned, the correct lighting profile is very important for the success of the Bolus Method. Ultimately, the lighting system should achieve a PAR value of 250–380. This can be easily checked using a PAR meter.

**CORAL:** Does the dosing need to be adjusted regularly, or is it constant?

**CS:** The dosing of the alkalinity solution is adjusted daily, with measurements taken at the end of the light phase. In most cases, however, a very stable value is reached after a few days to a few weeks. With a KH monitoring system, this adjustment can be tracked from the beginning.

However, we recommend making changes slowly, and never adjusting the Bolus dose by more than 5 percent up or down. Small changes of 2 percent in the dose tend to work best. Signs that the Bolus dose should be reduced may include, for example, a significant increase in alkalinity that accumulates day by day and/or a pH level that is much higher than normal both after the Bolus dose and at the end of the day.

When increasing the Bolus dose, a rise in pH should be expected, and it's important to monitor alkalinity to ensure that it doesn't spike too dramatically after the ad-

justment. Any peaks in alkalinity should stabilize within 24–48 hours.

**CORAL:** Who developed this method, and how did it come about?

**CS:** The idea for the Bolus Method arose from observing that traditional dosing methods had weaknesses. In earlier times, it was common to dose relevant solutions once in the morning, before dosing pumps were widespread. In collaboration with a coral farming colleague from England (Frag Farm Ltd, UK), we decided to further develop this early, highly successful approach.

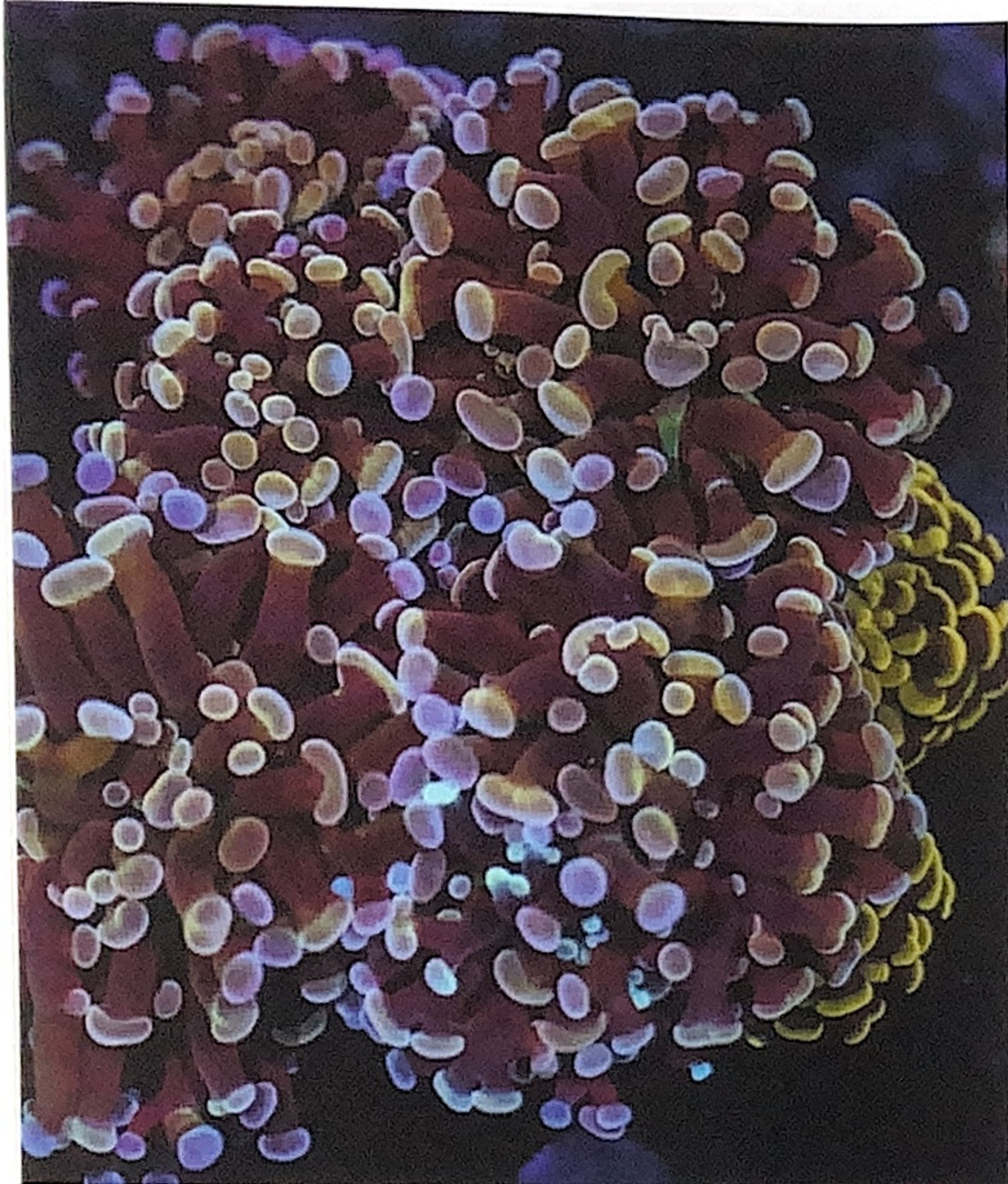
What's especially interesting are the chemical and physical aspects of the method. Some of the effects we observed cannot be explained using the classical understanding of alkalinity. However, a marine aquarium is nothing like a laboratory environment. The large bioactive surface area, skimmer, and corals create an environment that cannot be equated to a purely chemical process.

A particularly important aspect is interrupting the loss of elements and the associated problematic buildup of a depot effect in an aquarium. Improper dosing of chemicals with a high pH (such as kalkwasser) leads to increased precipitation. These precipitates consist of hydroxides and carbonates, which remove organics and nutrients, but also trace elements and halogens from the water. These substances are deposited on surfaces and partially broken down there, but over time they become available again—especially for algae and cyanobacteria. So, it's only a matter of time before the dreaded Old Tank Syndrome arises. The Bolus Method can prevent this.

The bicarbonate used in Fauna Marin's alkalinity mix temporarily lowers the pH after dosing and thus



This small-polyp stony (SPS) aquarium demonstrates the success of the Bolus Method.



prevents precipitation. The  $\text{CO}_2$  generated during this process is expelled, and microcrystals that form on surfaces help build the buffer system. These microcrystals establish equilibrium with the bicarbonates in the water. As the bicarbonates are consumed, they are replenished via the buffer system.

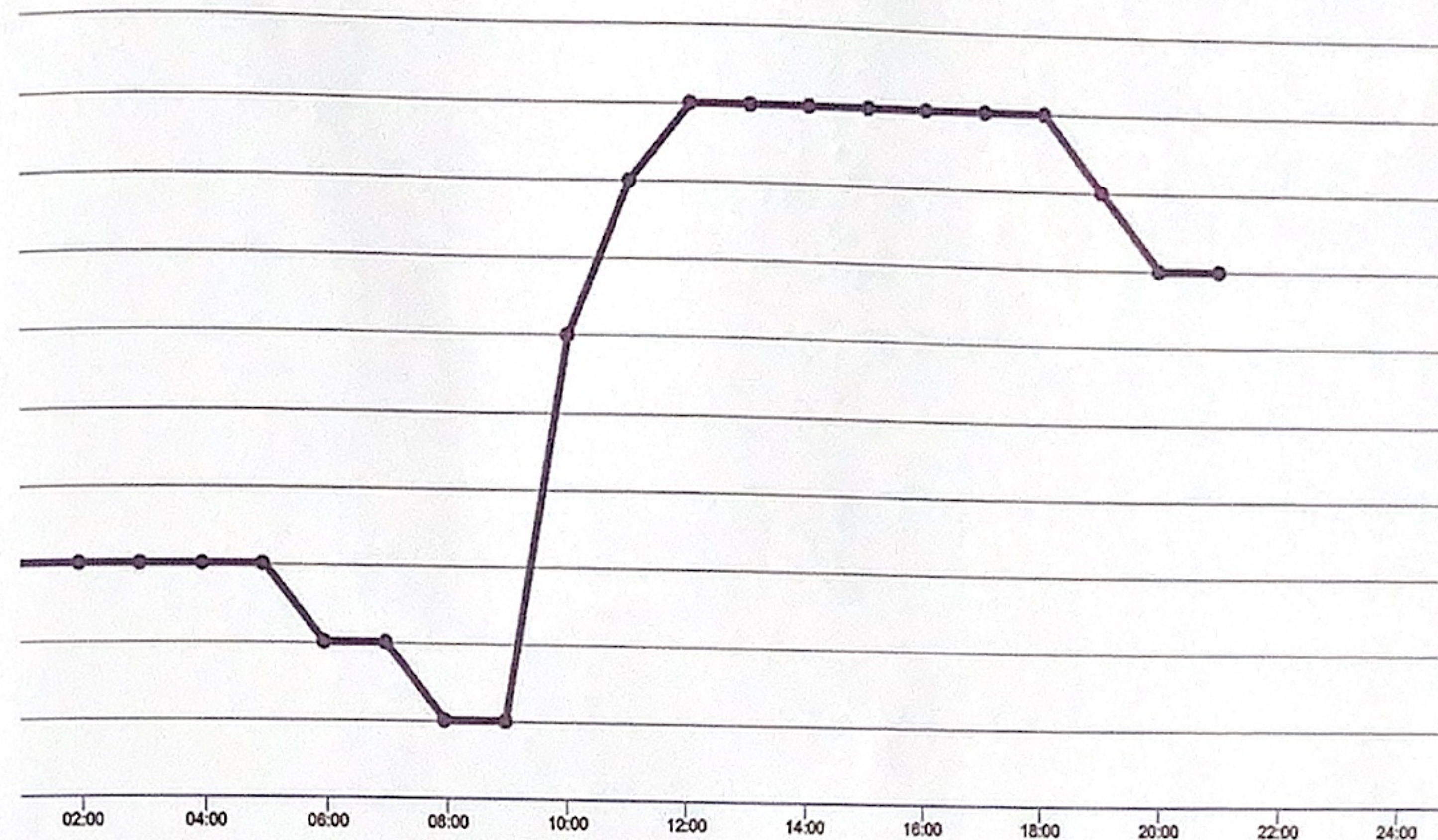
In developing the method, we deliberately tried to think outside the usual paradigms. We analyzed data from over 200,000 water tests, which revealed clear trends across different systems. In traditional aquarium chemistry, people often rely on common textbook interpretations. For example, the widespread belief is that using bicarbonates does not raise the pH. However, as Armin Glaser already described in his book *Ratgeber Meerwasserchemie, Guide to Marine Aquarium Chemistry*, (from Rüdiger Latka Verlag), in open aquarium systems, that's simply not true.

If you look at the full picture and free yourself from such "articles of faith," you also uncover the real mechanisms behind why this method of application provides a clear advantage in aquarium care. Unlike in controlled lab settings, an aquarium contains a large bioactive surface. This biofilm, in particular, plays a crucial role in the carbonate cycle of an aquarium and can contribute to stabilizing the pH.

The microorganisms embedded in biofilms are capable of absorbing carbon dioxide ( $\text{CO}_2$ ) from the water and converting it into organic compounds. This process can indirectly affect bicarbonate concentration, since  $\text{CO}_2$  reacts with water to form carbonic acid, which then dissociates into bicarbonate and protons. By reducing dissolved  $\text{CO}_2$ , a balancing effect can occur that stabilizes bicarbonate levels.

The extracellular polymeric substance (EPS), which surrounds the microorganisms in the biofilm, also acts as a nutrient reservoir and binds bicarbonates. This allows bicarbonate to be held within the matrix and released as needed. However, the exact mechanisms of bicarbonate binding and release by biofilms are complex and depend on

The Bolus Method is suitable for both large-polyp stony (LPS) corals (top: *Euphyllia cristata*) and small-polyp stony (SPS) corals (bottom: *Acropora* sp.).



The "tabletop effect" in the Bolus Method describes the flattening of carbonate hardness consumption over the course of the photoperiod. A detailed explanation can be found in the text below.

various factors such as pH, ionic strength, and the specific composition of the biofilm.

In summary, biofilms—through their metabolic activity and the EPS they produce—indirectly influence bicarbonate concentration and thus contribute to the pH stability in aquariums.

**CORAL: What are the advantages of the Bolus Method?**

**CS:** The method stabilizes carbonate hardness through what we call the "tabletop effect", in which the carbonate hardness is not fully detectable immediately after dosing, but steadily increases throughout the entire photoperiod. In addition, minerals are released slowly from deposited pools, storage depots are dissolved, and precipitation is avoided. Overall, the animals respond with enhanced growth and more vibrant coloration.

Here's an example of the tabletop effect: When a large single dose is administered, you would normally expect a sharp increase in alkalinity if you measured right after dosing. However, in all of our tests, we found that when dosing, for example, 1.6 dKH of *Balling Light Carbonate*, significantly less [of the sharp increase] was detected when testing alkalinity shortly afterward. Often, an alkalinity test would show only 50 percent or less of the expected value—so the result would misleadingly suggest that only 0.8 dKH had been added. For this reason, we strongly recommend making dosing decisions based on alkalinity measurements taken in the

evening and/or at the time of peak pH. This is a unique characteristic of the Bolus Method.

**CORAL: What are the technical requirements for applying the Bolus Method?**

**CS:** We've been using the method successfully for two years now. It has also been in use for quite some time in several public aquariums. Coral growth and polyp extension have clearly improved, and the color contrast of corals has become more intense.

No special technical equipment is required to implement the method. However, it can be combined with KH monitoring gear (e.g., *Trident*, *iV Pro*, *AquaWiz*, or similar) to dose at the specific time noted. However, automatic dosing based on measurement systems is not recommended for the Bolus Method.

**CORAL: What are the risks?**

**CS:** The method is simple and safe! Even in the case of an accidental overdose, the alkalinity is buffered, so no immediate negative effects are to be expected. If a dose is missed, that's also not a problem, because the aquarium's natural buffer system is stabilized by Bolus.

The absence of this buffer was something that users of the kalkwasser method noticed decades ago. With kalkwasser, the strong increase in pH can lead to precipitation—and it doesn't result in the buildup of buffer capacity as it does with Bolus. A simple test shows the

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The Bolus Method helps improve coloration and polyp extension, shown above with an *Acropora* sp.

difference between carbonate/kalkwasser-based systems and bicarbonate systems like those used in the classic Balling and Balling Light methods: stop carbonate dosing for a day. In high-pH systems, there's a crash in KH, whereas in bicarbonate systems, the carbonate hardness drops very slowly, showing that the system is buffered.

If kalkwasser and carbonate systems are overdosed, the high pH level damages corals and leads to heavy precipitation, which in turn requires significantly more trace elements and organic substances to be re-dosed. These effects are harmful over the long term! They often go unnoticed at first, as the consequences develop gradually. Most users only become aware of them once the damage becomes visible over time.

The Bolus Method offers marine aquarists an innovative, effective, and safe way to stabilize carbonate hardness and promote coral growth and coloration. The method combines scientific understanding with practical application to help build long-term, stable aquarium systems.

Readers are welcome to contact me directly at [support@faunamarin.de](mailto:support@faunamarin.de).

ONLINE

For further information about the Bolus Method, Fauna Marin published a detailed and comprehensive manual on their website: [https://www.faunamarin.de/wp-content/uploads/2024/05/BOLUS\\_EN\\_How-To-Use\\_24\\_05\\_24\\_.pdf](https://www.faunamarin.de/wp-content/uploads/2024/05/BOLUS_EN_How-To-Use_24_05_24_.pdf)



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