The parameters of the water – Indicators of its quality

The **pH-value** can be considered the most significant parameter in characterizing your water quality. It determines whether the water is too acidic or too alkaline, and whether this condition can have a detrimental effect on fish or plants. In an intact ecosystem, the pH-value of the pond water should be situated between 7.5 and 8.5. Most natural lakes or ponds, containing calcium and being exposed to the carbon dioxide in the atmosphere, display a pH-value of 8.2 - 8.3. At this pH-level, the concentrations of the hydrogen carbonate ions and carbonate ions contained in the dissolved carbon dioxide are balanced. A pH-value above or below this level is acceptable within the limits mentioned above. However, this is usually caused by unfavourable environmental factors, human intervention, or the effects of civilization on the habitat water. The pH-value is an important parameter with regard to the ammonium and nitrite levels.

The **conductivity** of the water can be considered an indicator of its salt content. Water that is low in ions has a very low conductivity, whereas sea water, for example, has a very high conductivity. The water's conductivity is usually measured in µS/cm (= Mykro-Siemens/cm). The conductivity of freshwater and pond water ought to be situated between 300 and 1200 µS/cm. If the conductivity is below this level, the water can be considered ion-deficient, and is bound to react to even minor influences, for example with a drastic change in pH-value. If the water displays a conductivity of above 1.200 µS/cm, it no longer comes under the category of freshwater.

Besides the soluble gases already mentioned, water contains a number of soluble minerals (ions). In this context, the water-soluble magnesium and calcium ions play an important role in building up the hardness of the water. The concentration of the magnesium and calcium ions dissolved in the water (e.g. in the form of chloride) determines the **total hardness** of the water. The total hardness of the water is an important component in a well-balanced pond ecosystem. No fish or plant could survive in water that is absolutely pure and ion-free. The hardness of the water is measured in °d.H. (from the German expression 'Grad(°) **D**eutscher **H**ärte'), or, alternatively, in mmol/l. The total hardness of natural freshwater is situated between 5 and 20°d.H. The total hardness is a combination of permanent and temporary hardness (= carbonate hardness).

The concentration of calcium hydrogen carbonate in the water is crucial for the stability of the pH-value. An indicator of this concentration is the water parameter known as **carbonate hardness**. A carbonate hardness that is sufficiently high can stabilize the water's pH-value by counteracting an increase or decrease in pH-value. It is for this reason that water displaying a sufficient level of carbonate hardness is called 'well-buffered'. The carbonate hardness, like the total hardness, is measured in °d.H., or, alternatively, in mmol/l. In natural freshwater, it should be situated between 5 and 12°d.H.

Nitrite is a water-soluble, inorganic nitrogen compound, which – in water – is produced from the insufficient microbiological degradation of nutrients (e.g. of food residues). Another cause of nitrite formation in a pond is its introduction via polluted inflows or via rain water (particularly after thunderstorms). If the ecosystem in the pond is intact, nitrite should not be scientifically detectable. Nitrite concentrations of only 0.2 mg/l can severely damage your pond in the long term, and may poison your fish. The main effect of nitrite is that it accumulates in the blood of fish and thus prevents their intake of oxygen. The fish show symptoms of suffocation. An important parameter with regard to the nitrite content is the pH-value. The lower the pH-value, the more toxic for the pond life an increased nitrite level becomes. The ammonium and nitrate levels, respectively, are also important parameters in relation to the nitrite content. If these are also increased, this is an indication of a biological imbalance in the pond or lake. Either your pond does not contain enough nitrogen-degrading micro-organisms, or the existing micro-organisms have been damaged and can therefore no longer work efficiently.

Ammonium, like nitrite, is a water-soluble nitrogen compound, which can enter your pond via fish excrements that have not been sufficiently microbiologically degraded. Ammonium can also enter your pond via fertilizers or surface water. An important parameter with regard to the ammonium content is the pH-value. The higher the latter, the more toxic for the pond life the ammonium becomes. In combination with an increased pH-level in the water, the ammonium turns into ammonia, which can severely damage the mucous membranes of the fish.

Nitrate, like ammonium and also nitrite, is a nitrogen compound, which exists in the water in its dissolved form. Nitrate is not toxic as such, but it acts as a nutrient for algae. Insufficient microbiological degradation can cause the nitrate level to rise. Another reason for an increase in nitrate is its introduction into the pond via surface water.

Phosphates are the main nutrient for algae. The phosphate level must not exceed 0.03 mg/l. Even the smallest increase can trigger off an excessive growth of algae. Phosphates are introduced via fish feed (all fish feed contains a certain level of phosphate), or when the pond is filled with water that is rich in phosphate. Tap water is often very high in phosphate. If unsure about the phosphate concentration in your tap water, your local water board will provide you - either by phone or fax - with the latest test results of your drinking water. Like nitrate, phosphate may enter your pond via surface water. Certain minerals in the building materials of your pond can also release phosphate into the water. Algae store phosphate in their organism. It is for this reason that - despite an excessive growth of algae - no phosphate can be detected in the water. The problem is that when the algae die, they release the previously absorbed phosphate into the water, which can trigger off the growth of new algae. It is virtually impossible to remove phosphate naturally. Almost always, special products are needed to bring down the phosphate content. Phosphates, and therefore algae, are the main problem in artificial ponds or.