



# Hardness



I certainly hope this is not too “hard” to understand.....

## Hardness

The concentration of dissolved salts affects the osmotic regulation systems in fish. There are two types of hardness: General Hardness (GH) also known as Total Hardness (TH); and Carbonate Hardness (KH) also known as Alkalinity or Temporary Hardness.

**General Hardness (GH)** is a measure of all chemically bivalent metal ions (primarily comprise of calcium and magnesium). These ions are important for skeletal growth. Excessively high GH will result in zinc deficiency cataracts and nephrocalcinosis. If GH is too low, deficiency syndromes like head and lateral line erosions (HLL) and Hole in the Head disease may appear. GH should be ~150ppm for freshwater community fish and higher for live bearers and rift lake cichlids). Important note is that snails can drop GH as they consume it for their shell growth.

**Carbonate Hardness (KH)** is the measurement of the capacity for water to neutralise an acid (i.e. the buffering capacity). The alkalinity is primarily composed of bicarbonate ions ( $\text{HCO}_3^-$ ) and carbonate ions ( $\text{CO}_3^{2-}$ ). Carbonate Hardness is important to stabilise the water pH (pH becomes highly unstable in water with a KH <55ppm); it is also an important source of energy for nitrifying bacteria that eliminate ammonia and nitrite and is used by plants for photosynthesis when carbon dioxide is absent. Desirable KH for freshwater fish (60-80ppm), for rift lake cichlids (120-200ppm) and marines (120-200ppm). Water can be softened by the use of distilled water, rainwater, reverse osmosis water or using peat moss. Water can be hardened





by adding limestone, shells, coral skeletons or Malawi salt. Water requirements given in fish keeping texts may use one of three kinds of descriptors for water hardness:

| Qualitative Descriptor | Degree hardness (°dH) | Hardness (ppm) or (mg/L) | Milli equivalents (meq/L) |
|------------------------|-----------------------|--------------------------|---------------------------|
| Very soft              | 0-4                   | 0-70                     | 0-1.4                     |
| Soft                   | 4-8                   | 70-140                   | 1.4-2.8                   |
| Medium-hard            | 8-12                  | 140-210                  | 2.8-4.2                   |
| Fairly hard            | 12-18                 | 210-320                  | 4.2-6.4                   |
| Hard                   | 18-30                 | 320-530                  | 6.4-10.6                  |
| Very hard              | >30                   | >530                     | >10.6                     |

For more detailed information contact [The Fish Vet](#)

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