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Tampa Bay Aquarium Society
27 Years
St. Pete/Tampa Florida

THE FILTER

Alto Compressiceps
Altolamprologus compressiceps

Photo Mike Jacobs . . . 2020

TBAS . . . Since 1992

TAMPA BAY AQUARIUM SOCIETY

"THE FILTER"

Tampa/St. Pete, Florida

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Ok guys . . . it's time for you to LEARN again . . . Part 2 of the Joe Gargas "Aquatic Chemistry Terms Explained" article is in this edition of "**THE FILTER**". Please take the time to go over this article (and the **March** issue) as many times as you can. You may only learn 1-2-3 terms everytime you go over it . . . **BUT THAT'S GOOD BECAUSE YOU ARE LEARNING!!!** That's how real education works!!! Little bit, little bit, little bit . . . almost nothing ever comes all at once!!!

Take care of yourself . . . please adhere to all of the restricitions we now have to deal with because of the Coronavirus!!! This is something that we all have to put our heads together with and get it solved. I believe the USE will solve this riddle sooner than everyone else . . . but only if we all cooperate.

See you folks soon!!!

Mike

Mike Jacobs, Editor TBAS Filter

Tropheus moorii chipimbi
Moorii Cichlid
Photo by Mike Jacobs 2020

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Aquaticc Chemistry Terms Explained - Pt2

by Joe Gargas

Alkalinity, Hardness, and pH . . .

Carbonate Ion, $C0_3$ is an anion which will accept a proton (W) to become $HC0_3^-$ which occurs in water below a pH of 9.0. The carbonate ion does not exist as carbonate below a pH of 9.0 but as bicarbonate $HC0_3^-$. This is what we as aquarists are used to as the buffer in our aquariums.

Carbon Dioxide, $C0_2$ is product of carbon oxidation in aerobic metabolism and in combustion; it dissolves in water to form carbonic acid and bicarbonate ion. $C0_2$ injection is used to stabilize the pH and as food for plants.

Carbon Oxidizing Bacteria derive their energy by the oxidation of organics, producing ammonia as a byproduct. This is the beginning process of biological filtration, which is called mineralization.

Cation is a positively charged, usually metallic ion. However there exist some nonmetallic cations such as the hydrogen ion (H^+) and the ammonium ion (NH_4^+).

Cation Resin, Strong Acid are polymeric beads which can absorb cations on negatively charged sulfonate groups. This is the cation resin used in water softeners.

Cation Resin, Weak Acid are polymeric beads that adsorb cations on a negatively charged carboxylate groups; this resin is rarely used.

Channeling refers to the formation of areas of increased flow by obstructions elsewhere. All filters with the exception of the fluidized bed are subject to channeling - one reason why it is advisable to clean them frequently.

Chelant is an organic substance which wraps around a metal ion, thus partially or totally shielding it from contact with the water. Copper removing products are a good example of a chelant. The chelant used is EDTA, but as the chelant breaks down in the water, copper would be released. One cannot predict how long it would take and how much free copper would be in the water at a given time.

Chemical Equilibrium is the state of dynamic balance between two or more competing chemical reactions. Ammonia and ammonium are in chemical equilibrium with pH.

Chemical Oxygen Demand is the amount of oxygen expended in the chemical oxidation of a water sample with a oxidant. Chemical oxidation is always stronger than biochemical oxidation (oxidation that is accomplished by bacteria-nitrification). Chemical Oxygen Demand COD always exceeds BOD

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biological oxidation.

Chloramines monochloramine. **NH_2Cl** and **dichloroamine, $NHCl_2$** are formed by the reaction of chlorine and ammonia and are very toxic to fish.

Chloride Cl^- is a common anion essential to all life. Formed by the reduction of chlorine, and chlorine-containing oxidants such as hypochlorite or chloramines. To tell if someone is honest about doing water changes a chloride test can be performed. Chloride will constantly increase - it cannot be oxidized or reduced by bacteria or chemically. High chlorides will result in poor hatches and larval development giving the thought of sterility.

Chlorine Cl_2 is a gas which is a strong oxidant; it dissolves in water to form hypochlorite ion, OCl^-, and hypochlorous acid, HOCI.

Coagulation is a synonym for flocculation in water treating. Products in the aquarium market include water clearing products; they work great but should not be used with fish in waters with low conductivity.

Colloids are particles of size less than 0.2 microns (submicronic) which do not settle from liquids on standing. Colloidal particles bear similar electrostatic charges, preventing them from agglomerating into larger ones, which would precipitate. The charges are like two magnetic forces repelling one another. This is why colloids do not settle upon standing. A flocculating agent is used to neutralize the charges, thus allowing the mater to agglomerate and be filtered out. Ozone will work in the same way.

Complexation is a process wherein a metal ion is partially or totally surrounded by smaller attached ions called ligands, which shield it from the water. This occurs when copper is used in waters that are strongly buffered. The bicarbonate ion attaches itself to the copper, thus ligating it. To copper treat ponds effectively, the bicarbonate ion concentration must be known (alkalinity x .65 = bicarbonate), then divided by 100; the result is the amount of copper that will be tied up by the alkalinity. You add the amount of copper that is needed for treatment along with the amount that will be tied up with the bicarbonate. Care should always be taken when using copper in waters that have a low alkalinity- in water such as these, copper can be extremely toxic and kill fish.

Conductivity is the magnitude of electric current carried in a conductor; in water solutions it is measured in Microseimens for analytical purposes.

Decationizing is the process of exchanging all cations for hydrogen ions. This is the process used in a water softener that is regenerated by muriatic acid instead of brine. This process is used now and then in the aquarium trade. However, the water must be aerated before using to remove the excess amount of $C0_2$. Depending upon the original alkalinity, the pH may have to be increased. This is due to all the cations being exchanged for hydrogen. Remember it is hydrogen that makes the water acidic.

Deionizing is the process of total ion exchange, where all the cations are exchanged for hydrogen, and all the anions are exchanged for hydroxide ions.

Desorption is a release of adsorbed materials from a surface back into the fluid or solution. If carbon is on an aquarium for a long period of time, it can

desorb all at once everything it has removed. It is a good idea to replace carbon at least every two weeks in a normal bio-load and weekly in a high bio-load.

Diffusion is movement of a fluid down a concentration gradient from an area of higher concentration to an area of lower concentration.

Divalent Cations are cations of +2 charge, in natural waters Ca^{++} and Mg++ account for almost all of the divalent cations which cause hardness.

Dystrophic Water is water that contains a high content of humic (organic) substances. This is the water of killies, apistos, altum angels and discus.

Flocculant is a chemical frequently containing aluminum or iron, or a polymer, which destabilizes the electrostatic charge on colloids so that they will agglomerate into larger particles that can be filtered out. Ozone is also known as a flocculating agent.

Fluvic Acids are a complex group of carboxylic acids similar to but lower in molecular weight than humic acids; both are produced in plant decomposition. Fluvic acids remain soluble at all pH values, whereas humic acids precipitate at a pH of less than 1) Fluvic acids and metal acids bind metal ions, releasing hydrogen ion in exchange, making them natural water softeners. They are found mainly in peat.

Hardness is the sum of divalent cations Ca^{++} and Mg^{++} they are expressed in parts per million calcium carbonate. $CaC0_3$???.

Humic Acids are a complex and diverse group of organic acids whose structure is not well defined. They consist of a mixture of poorly biodegradable decomposition products of plant matter which have a high molecular weight and are less oxygenated then fluvic acids. Humic acids are not soluble below a pH of 1. They exchange protons for metal ions, acting as natural water softeners in peat.

Hydrogen Carbonate (Bicarbonate) $HC0_3^-$ is the major anion and pH buffer of natural waters; it is produced by the dissolution of carbon dioxide in water.

Hydrophilic means polar, and highly water soluble (water loving).

Hydrophobic non polar, non water soluble (air loving).

Hydroxide Ion, OH^- is an extremely strong base which reacts with the hydrogen ion to produce a water molecule.

Hypertonic refers to a salinity higher internally than externally - a freshwater fish.

Hypotonic refers to a salinity lower internally than externally - saltwater fish.

Ion is an electrostatically charged particle. Ions are produced when acids, bases, salts, and some polar compounds are dissolved in water.

Isotonic means having equal osmotic or ionic strength externally and internally - protozoans.

Kinetics is a branch of chemistry concerned with the rate of reaction.

Laminar Flow is smooth flow in parallel layers without turbulence. This often takes place in a fluidized bed.

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Magnesium Mg^{++} is a common cation existing in natural waters and one of the major hardness components. It is essential to life.

Micrograms per liter ug/l is a unit of measurement equal to parts per billion (ppb) in water.

Milligrams per liter, mg/l is a unit of measurement equal to parts per million (ppm) in water.

Mixed Bed Ion Exchanger is an ion exchanger with equal quantities of strong acid cation resin and strong base anion resin mixed together. This is available to the hobbyist in deionizing columns. When both resins are mixed together, one will get a higher water quality than if they were separate. They can be regenerated by separating the resins from one another and using muriatic acid on the cation and sodium hydroxide on the anion.

Molecular Weight is the sum of atomic weights of all atoms in a molecule.

Monovalent Ion are ions of only one unit of electrostatic charge, e.g., NH4+ ammonium, Na^+ sodium.

Nitrite, $N0_2^-$ is an anion which is an intermediate oxidation product of the bacterial nitrification process; this is toxic to freshwater fish more so than ammonia.

Nitrate, NO_3^- is the final oxidation product of bacterial oxidation in the nitrification process. It is reduced to molecular nitrogen, N_2 in anaerobic bacterial denitrification.

Nitrification is bacterial oxidation of nitrogen: Nitrosomonas oxidize ammonia NH_3 to nitrite $N0_2^-$ and then Nitrobacter oxidize nitrite NO_2^- to nitrate NO_3^-.

Nitrous Acid, $HN0_2$ is the acid of the nitrite anion; as the pH drops below 7, a portion of nitrite $N0_2^-$ will become nitrous acid, which bonds to the iron atom in the hemoglobin molecule, rendering it incapable of oxygen transport; it is very toxic to fish and cannot be made nontoxic. The pH of any aquarium should not be reduced if any nitrites are present.

Osmoregulation is the maintaining of a constant salinity inside a biological organism.

Osmosis is molecular diffusion through a semi permeable membrane.

Osmotic Shock is a sudden change in external ionic strength which exerts high osmotic pressure across membranes as water diffusion rates rise sharply. This is how salt dips for fresh water fish and freshwater dips for marine fish work to kill parasites.

pH is the negative logarithm of the hydrogen ion concentration; every unit of pH change represents a tenfold change in acidity.

Redox is a pH dependent index of the chemical oxidizing potential; for every unit the pH drops, there is a 59-millivolt rise in the redox potential. Low redox values are associated with declining aerobic and photosynthetic activity.

Reverse Osmosis refers to the process of pressuring molecules through a semi permeable membrane against a concentration gradient.

Titrametric Analysis is a method wherein a water sample is reacted with

a standard reagent and the volume required is used to calculate the result.

Total Dissolved Solids, TDS refers to the concentration of all solids dissolved in water. TDS is a gravimetric test in which a water sample is vaporized and the residue is weighed. An estimate of TDS can be made by multiplying .64 to conductivity in Microseimens; however, this is not always accurate.

Circulating Bio Contactors (CBCs) are relatively new in the aquarium trade. They are entirely a Biological Filter for the process of Nitrification. They do not trap particulate matter thus they never clog! Because of this they never have to be cleaned. Their sole principle is the conversion of Ammonia NH3 to Nitrate N0. As you can see in the video the filter media is in constant motion moving from top to bottom allowing for a tremendous amount of surface area for nitrifying bacteria.

Go To Joe Gargas's Website Below for this Filter - it's GREAT!!

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MEMBERSHIP DUES!!!!

Membership Dues for TBAS are due on the anniversary of your sign-up date every year. Please make sure you check the "sign-in" list on the table at every meeting to check your "Dues-Date" . . . Thanks!!!

USE PAYPAL ON THE TBAS WEBSITE . . . TBAS1.COM . . . !!!!!

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Did You Hear That?

I talk to fish. I can't help it. I just have to talk to them. The other day a friend of mine laughed at me and said, "Where are there ears?" "Fish don't have ears," I told her. But it got my curiosity up and I looked in my books. Well, I was wrong, fish do have ears . . . inner ears to be exact. The inner ear is usually located right behind the brain and picks up high frequency sound, up to 8000 hertz (cycles per second). Some fish, like Characins, have a keen sense of hearing because the inner ear is highly developed. The swim bladder acts as a receiver and amplifier for sounds that are passed to the inner ear by means or a series of connecting bones called the Weberian ossicles. This allows them to sense danger quickly and to form schools.

The inner ear in fish also works much like the human inner ear in helping with balance. The fluid within the three semicircular canals triggers receptors that register turning, tilting and acceleration. This enables the fish to orientate themselves in the three dimensions within the aquatic environment.

Fish actually rely heavily on their sense of sound, which in water become pressure waves. They use the inner ear for high frequency sounds and they use their lateral line system for low frequency sounds, as low as 1/10 to 200 hertz. The lateral line consists of rows of mucous-filled sensory buds along a certain line which is located in a narrow channel beneath the skin and the scales. Some fish have more than one lateral line or an irregular lateral line. The lateral line also informs the fish on the strength and direction of currents, helps schooling fish after dark or in muddy waters and aids in migrating.

Until next month, keeping talking to your fish, they might hear you (understanding you is a different matter).

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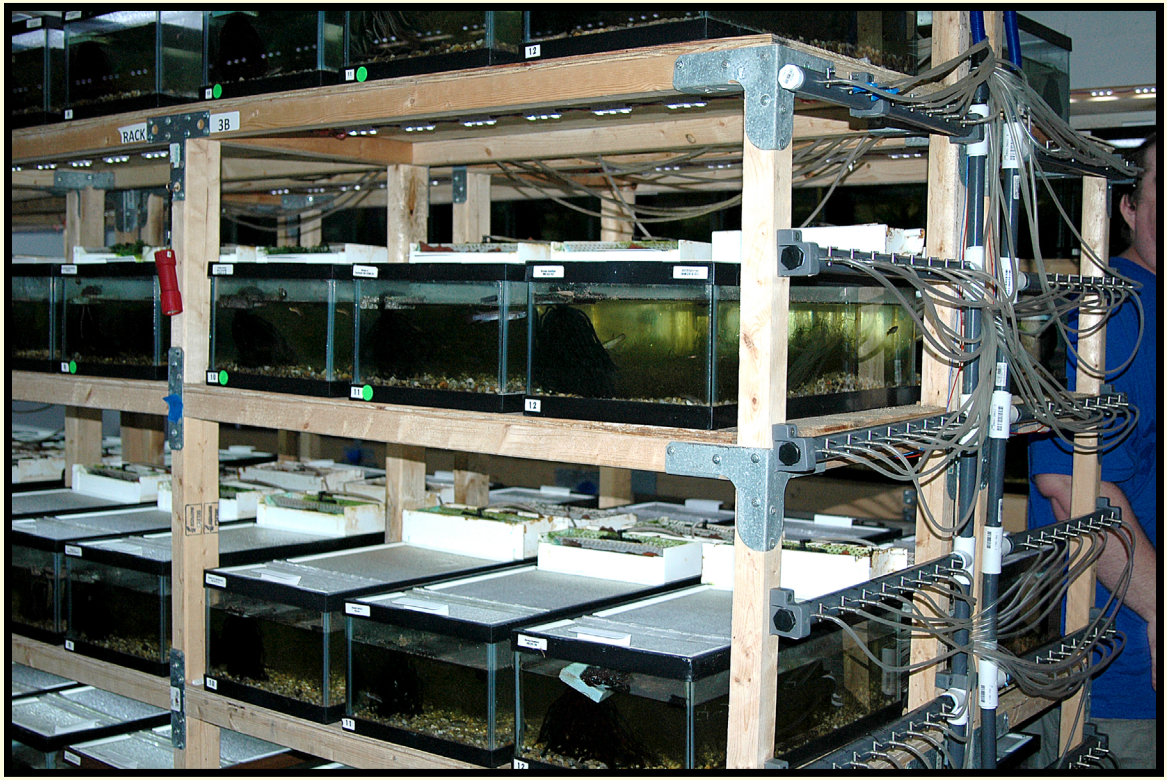
We are ALL a Little Nuts . . . But Ken Normandin???!!!

Trust me folks, aquarium keepers are all a bit “looney-tunes” . . . ☺☺!!! But, the SKS (Suncoast Killifish Society) went to Jacksonville to a member’s house for a meeting and here is a brief view of Ken Normandin’s fish tanks. All of the stands are 4 high and the 2 middle stands have a front and back rack of stands. I didn’t count them but there is easily over 150 tanks and he feeds them at least twice a day!!! To me this is **NIFTY, NIFTY** . . . but a little bit **NUTS** . . . ☺ ☺ ☺ !!!



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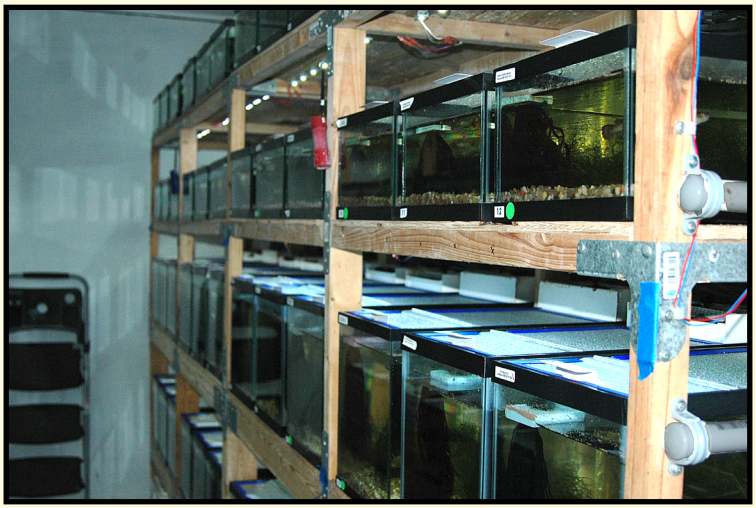

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Angels Plus
www.angelsplus.com

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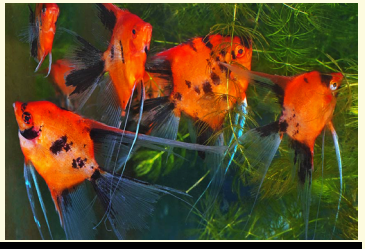
to See Video



THE BEST KOI ANGELFISH IN THE UNIVERSE

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***Paracheirodon innesi* . . Long-finned Neon**

photo: Mike Jacobs 2020

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alphabetical order

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