Water testing

Determining the quality of aquarium water is easy to do. You can purchase test kits that will measure all of the parameters mentioned and more.

Test kits are available in liquid, tablet and strip forms. The liquid test kit works by adding a specific number of drops to a measured sample of aquarium water. The sample changes colour, which can then be compared to a chart to calculate the result. Tablet tests are very similar but use tablets rather than liquid drops. Strips are also available where the strip is dipped into the aquarium before comparing to the colour chart.

Testing the salinity is performed using a different method. An instrument known as a hydrometer is either placed within the aquarium or filled with aquarium water depending on the style. It must be remembered that these instruments actually measure specific gravity (or SG for short). This closely approximates the actual salinity. For a more accurate measure, the SG and temperature can be used to determine the salinity from a chart often provided with hydrometers.

To obtain greater precision and accuracy in the results, additional testing equipment is available. Electronic pH probes can measure pH to a greater level of degree and precision, and controllers can also be obtained to regulate the pH. These are useful when using carbon dioxide fertilisation in heavily planted aquaria.

In addition to hydrometers, refractometers can be used to measure salinity. These devices are easy to use and can provide a greater level of precision for determining salinity.

Precautions

The chemicals used to test water quality may be hazardous to health. Always take care when using these kits and ensure they cannot come into contact with your livestock. Also take care when testing to avoid any spillages and store out of reach of children and other pets.

Always follow the manufacturer's instructions carefully. Many colour-based test kits require a specific amount of time to elapse before comparing to the provided colour chart. Ensure you observe the instructions fully to ensure that your testing is accurate. Also note that some of the chemicals used cannot be stored indefinitely and may lead to incorrect test results if used outside of this period.

Checklist

Before you buy make sure:

1. You have the appropriate equipment and position for the aquarium.
2. You have researched all the species you are interested in and your final choices are all compatible.
3. You are familiar with how to transport and release your fish.
4. You are aware of the daily, weekly and monthly maintenance your aquarium will need.
5. You are prepared to look after your fish properly for the duration of their life.

Never release your aquarium animals or plants into the wild

Never release an animal or plant bought for a home aquarium into the wild. It is illegal and for most fish species this will lead to an untimely and possibly lingering death because they are not native to this country. Any animals or plants that do survive might be harmful to the environment.

Scan this code to download an electronic copy

If in doubt contact your OATA retail member for further information

Ornamental Aquatic Trade Association Ltd
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May 2013

How to...

Understand & test water quality

3 General maintenance

Introduction

People are often intimidated by water chemistry, but in reality, water chemistry is simple to understand and testing water is easy to carry out. By taking the time to understand what's involved, you'll find fish keeping more enjoyable.

It is sometimes said that fishkeeping is not so much about looking after fish, but looking after water. In other words, fish are entirely dependent upon their aquatic environment for their health and well-being, and by ensuring that the water is adequately filtered, aerated and kept at the correct temperature, the fish will thrive.

Basic principles

A fish living in water is much like us being surrounded by air. If our air is full of smoke and noxious fumes, breathing and living become quite unpleasant. The same is true for fish living in polluted water. While we can see smoke in our air, we would expect that the aquatic equivalent would be cloudy water. It is then understandable to believe the misconception that if the water looks clear, the water quality is acceptable.

Many chemicals, including strong acids, bleach and white spirit are all transparent, but highly dangerous if ingested. Similarly, much of the pollution that a fish may experience is also invisible to our eyes.

pH

Many people are familiar with the concept of pH, but this parameter has some unusual properties that are important to understand. The pH of a liquid simply refers to how acidic or alkaline it is. A neutral substance has a pH of 7, acidic substances have a pH below 7, while alkaline substances are above 7. The further away from this neutral point, the stronger the acid or alkali.

However, the pH scale is not a simple scale. For each whole unit pH change, the strength of the acid or alkali changes tenfold. For example, a pH of 4 is ten times more acidic than a pH of 5, and 100 times more acidic than a pH of 6!

The reason why this is important is that fish come from all over the world; some from acidic waters, some from alkaline waters. If placing a fish originally from acidic waters into alkaline waters suitable for other fish, it may experience a 1,000 times difference in pH from what it is used to.

Nitrogen

Approximately 78% of the air that we breathe is made of nitrogen gas. However, nitrogen also exists in a number of different forms. Nitrogen is the fourth most abundant element in a fish's body. It can be found in the protein that makes up muscles, to the DNA present in every cell in the body. Fish get all of their nitrogen needs by consuming plant and animal matter, digesting it and incorporating it into their own tissues.

This process is efficient, but as with many biological processes, harmful waste products are produced. One of these nitrogen based waste products is ammonia (given the chemical formula of NH_3). Many waste products produced by organisms are toxic and must be voided from the body. In fish, this waste product is principally released by the gills.

In their natural habitat, the consequence of ammonia is insignificant. The sheer volume of water quickly dilutes any such ammonia to low concentrations. However, in captivity, the body of water contained in an aquarium is finite. Without additional equipment, the concentration of ammonia would quickly rise.

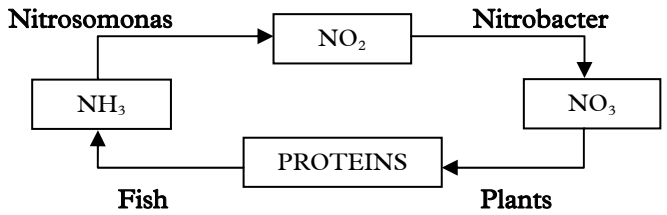
Biological filtration

In a mature, healthy aquarium, ammonia poses little threat. Ammonia is much more of a problem in newly setup aquaria or over-stocked aquaria.

In a new aquarium with fish, ammonia will start to rise. With time, 'friendly' bacteria colonise on all the available surfaces (including the media within the filter). These bacteria, collectively known as *Nitrosomonas*, are able to use ammonia as a source of energy. Once again, this process is not without associated waste products. Instead, these bacteria convert ammonia to a substance known as nitrite (NO_2). Similarly, this chemical is also toxic to fish.

Finally, an additional group of 'friendly' bacteria, known as *Nitrobacter*, are able to utilise nitrite as an energy source. Their waste product is another chemical known as nitrate (NO_3). This chemical is relatively non-toxic to fish. It is diluted by partial water changes or taken up by plants and algae that produce their own proteins.

This completes the cycle by re-entering the food chain where it may once again be consumed by fish.



Oxygen

Oxygen is one of the most important chemicals to life. While abundant in atmospheric air (approximately 21% of the air we breathe), its availability in water is considerably lower. Not only is oxygen important for fish, it is also consumed by the useful bacteria that remove the fish wastes.

Just as with pH, fish also have differing needs for oxygen. Some fish originating from fast flowing rivers have high oxygen demands, but some fish have adapted to low oxygen levels. Such fish often have unique adaptations to cope with low oxygen, such as the ability to breathe atmospheric air.

Salinity

Nearly 71% of the Earth's surface is covered by water, with the vast majority being oceans. The average salinity of sea water is approximately 35 grams of salt for every litre of water. However, the salinity is not uniform across the globe. Some oceans have a higher salinity, such as the Red Sea, whilst the salinity of the Baltic Sea is less than half of the global average.

In a marine aquarium, there is one major process that causes a change in salinity; evaporation. The temperature of the water combined with the heat from the lights leads to water molecules changing from liquid to a vapour. This leaves all the minerals and salts behind. If this water is not replaced, the salinity will increase, which could have detrimental effect on the fish.

Hardness

While abundant in seawater, freshwater can have varying amounts of minerals such as calcium and magnesium. Many people are aware of what kind of water they have in their area. Rapid scale accumulation in kettles is normally a clear indication of a hard water area. Other indicators include the ease of generating a lather when using soap.

Rivers and lakes across the globe vary considerably. The Rift Valley Lakes in Eastern Africa are well known for hard water, whilst the blackwater rivers in South America are exceptionally soft. The fish found in these environments have evolved over thousands of generations and have adapted to these water conditions. As such, placing species from one water type to the other could have detrimental effects on the fish. Nevertheless, some species are adaptable and more robust and may adjust to being kept in water quality of a different type. Manipulating the water hardness is possible and can be considered when choosing fish.