The Science of Water

The Nitrogen Cycle

The "Nitrogen Cycle" refers to a natural biological process which occurs in any body of water containing fish, plant life, or any sort of organic materials. This process biologically cleans the water of certain toxins produced directly or indirectly by the fish and/or plants themselves, or by the decomposition of any organic materials. These toxins are harmful to your fish. You could say the fish are living in their own toilets, and the Nitrogen Cycle is the cleaning service supplied by Mother Nature to eliminate these wastes!

The three main toxins produced have varying degrees of toxicity and are: (1) Ammonia, (2) Nitrite, and (3) Nitrate. I cannot stress enough that understanding this basic concept is the most crucial part of fish keeping, and, as such, you should read this until you have a good understanding of it, and acquire individual water test kits to routinely test for each of these compounds. This article will explain this process in detail, and give you some ideas on how to create ideal conditions to promote and encourage this cycle through filtration and the type of media utilized.

How it Works

Basically put, it starts with the fish, which respire and produce wastes that break down in the water and cause Ammonia to build up. When the Ammonia starts showing up, **only then** does this promote the growth of a specific bacteria colony (Nitrosomonas), which let's say "eat" the Ammonia and convert it to less toxic, but still harmful, Nitrite, which is the waste product of these bacteria. When the Nitrite shows up as a byproduct of the first bacteria, only then, does this promote the growth of a second bacteria colony (Nitrobacter), which "eat" the Nitrite and convert it to less toxic Nitrate. This complete process is referred to as "The Nitrogen Cycle" .

Filtration

There are three main types of filtration utilized by the average pond keeper. They are: (1) Mechanical, (2) Chemical, and (3) Biological. Here we will discuss only the very basic principals and types that can be utilized. Other types of superior filtration can be very complex, and costly, but can do a much better job, but this basic discussion is for the novice with a limited budget and knowledge.

Mechanical

A mechanical filter is simply some type of filter or media which is primarily used to remove or capture solids such as fish wastes, debris, dead plant materials, etc. There are many designs you can purchase or easily make yourself. We will talk about these in detail later in this article. **I would like to stress that the REMOVAL of these organics from the system is a key element in keeping your fish healthy.**

Chemical

A chemical filter is one which utilizes some sort of Ammonia-absorbing media such as Carbon/