



100 Years of Fishkeeping: Good Advice Never Grows Old

Dr. Timothy A. Hovanec

The last 100 years of aquarium fishkeeping has seen a large increase in the amount of technical information available to the average fishkeeper. Further, great strides have been made in equipment development and manufacturing. Thus keeping an aquarium has come a long way from the year 1900. One would have to admit that maintaining an aquarium in 1900 was not easy and there wasn't much in the way of equipment or choices of fish. However, it was novel and many people found aquaria enticing. This is familiar even today--people get excited when they see a beautiful aquarium and wish to have a little bit of that excitement in their own home.

But consider for a moment that the aquarist is still needed. There are no perpetual-aquaria, meaning an aquarium that keeps on going without the intervention of an aquarist! While some companies tout that their products make water changes and filter-cleaning obsolete, the truth is that no products do this. The aquarist is still at the heart of every aquarium. In addition, the whole purpose of having an aquarium is to have beautiful, amazing living creatures in our home. If one just wanted colorful movement, then a computer aquarium would suffice. Aquaria and people go together--having one without the other is emptiness.

These days, a wide variety of freshwater and saltwater fish can be successfully maintained in aquaria for extended periods of time. In fact, many species will spawn in aquaria. Further, many corals and invertebrates can be kept in properly set-up aquaria. But sometimes it also feels like the hobby is too complicated; that there are too many filtration methods, pieces of equipment, chemical additives, water quality adjusters and other paraphernalia that one needs to be successful in this hobby.

This is not the case and the goals of this article are to: 1) quickly review some of the major events in aquarium keeping over the last 100 years, and 2) show that while these advances have clearly helped develop the hobby, the success of an aquarium depends upon the aquarist today as much as it did in 1900. In other words, equipment and technology have not replaced the aquarist.

Why is this the case? First, consider that as the technology to provide good water quality has advanced, the density of fish in the aquarium has also increased. Nowadays no one would set-up an aquarium to house just one or two fish. In 1900, the hobbyist

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had no choice. Today he or she does and they choose to have more fish. The common rule of thumb for stocking aquaria today is, "one inch of fish to one gallon of water." However, do you know that this rule was already in print by 1921 (page 7, "Goldfish Varieties and Tropical Aquarium Fishes" by William T. Innes)! Innes makes other statements that are as true today as they were nearly 80 years ago. One is that aquarists "kill their fish by kindness." They do this by feeding their fish whenever the fish "look" hungry. Fish are constantly searching for food but that does not mean the fish should be fed all the time. A little less food will improve water conditions. He goes onto state another common "rule" which is, "fish should never, on any account, be fed more than will be consumed at once...If any food is left after five minutes, they have been overfed and the surplus should be removed." How many times have you heard or read this rule? Did you know it is nearly 80 years old!

Thus two cardinal rules of fishkeeping today, with our air pumps, high-tech filters and sophisticated knowledge, come from an age when aquarists had none of these advances. This can be both positive and negative for us today. The "one inch of fish to one gallon of water" makes sense for a time when there were no filters or aeration devices. But today, that rule is too conservative and one can put more fish per gallon. However, for a beginning hobbyist the rule still makes sense because it provides a greater room for error on the part of the aquarist without injury to the fish.

Innes does mention some pieces of equipment in his 1921 book. He states that electrical air pumps are available but expensive. He also presents a drawing of a lift tube attached via a siphon to an aquarium for the purposes of aerating the water. However, there are no mentions of nitrification, filter boxes and other types of equipment.

But 15 to 20 years later things have changed some. In his book "Exotic Aquarium Fishes," Innes talks about aeration with small electric pumps. He also correctly states that "it is the common impression that some of this air is *forced* (italics his) into the water, but such is not the case." So even early attempts to stop some aquarium myths failed as even today some authors and otherwise knowledgeable hobbyists believe that the rising bubbles force air into the water. The truth is that the bubbles cause the water surface to be disturbed, increasing the water-air interface which allows more oxygen to diffuse from the air into the water.

Innes also provided a drawing of a simple internal aquarium filter which contained adsorbent cotton and charcoal which operates with a lift tube. He mentions that the cotton should be cleaned every few days and that "any filter should be cleaned frequently and thoroughly." Does this sound familiar?

Today, some 50 to 55 years later, the very same advice holds true for aquaria with

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modern filters. Today's filters may be more efficient electrically and there is a greater range of sizes and types, but they still must be cleaned. Why is that? Because the job of the filter is to first trap and hold the particulate matter in the aquarium water. But no filter removes the decaying matter from the aquarium water completely. Thus today we know that heterotrophic bacteria will decompose the organic material trapped in the filter which results in oxygen depletion of the aquarium water and adds ammonia to the aquarium. The job of the filter is to trap the material; the responsibility of the hobbyist is to remove and clean the filter pad. Again, the aquarium and the aquarist are linked.

Other books from the 1930's follow roughly the same outline of Innes'. The book, "Tropical Fishes and Home Aquaria" authored by Alfred Morgan and published in 1935, presents some detailed drawings of filters and air pumps with airstones. The author lists a few situations where the use of an air pump and/or filter is needed. But he recommends that the beginner stay away from these situations and not rely on these "artificial" devices. It is interesting to note a few of these special cases. One is when tanks "receive no sunlight or insufficient light to bring about proper photosynthesis on the part of the plants." Another is when "...tanks are overcrowded. Many more and much larger fish can be kept in a tank of given size when the water is aerated." Today, few hobbyists would set-up a tank without a filter or air pump because they don't want to limit themselves in terms of the number of fish they can have. Also in the early part of this century, one did not set-up an aquarium without plants. Plants were central to the aquarium because they provided oxygen for the fish and removed carbon dioxide which was the result of fish respiration. Today it is the specialist hobbyist who uses an abundance of plants in an aquarium. Most of today's aquaria, if they have plants, have too few to be effective as filters.

A primary reason for the demise in the use of live plants in the aquarium can be attributed to the use of artificial filters. However, one could effectively argue that the increased use of filters and subsequent decline in the use of live plants has resulted in the aquarium of today having poorer water quality than the aquarium of the 1920's and 30's. The reason is that plants remove many things that our "advanced" filters do not. For instance, as mentioned, plants remove carbon dioxide, plants also remove nitrate. While filters can be purchased to do this, they are not as effective as plants and they are not commonly used. It follows then that even with the advances in filtration, if the water quality is poorer in today's aquarium, then the fish hobby has not advanced as far as one might think in the last 100 years. Of course, there are exceptions to this, but if you think on a general scale of the average aquarium without plants, which is overcrowded and overfed you can start to see what I mean. Are the fish really better-off these days? It would be interesting to compare water chemistry data from a number of aquaria in the 1930's to aquaria of today to see if my premise holds water (pun intended!).

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No books in the 1940's and 50's that I know of mention nitrification and biological filters explicitly. However, the 1950's saw the introduction of what would become the most common filter in an aquarium in the United States: the undergravel filter. The first undergravel filter was called the Miracle Filter and promised to do almost everything! It could prevent ice (according to the author, the water flow through the gravel would be of such force that the ice spore stage could not get out of the gravel and into the water column to infect the fish); it never had to be cleaned and it provided perfect water quality. The undergravel filter became so popular that for years just about no aquarium was set-up without one. We now realize that aquaria can be successful without an undergravel filter--just as they were before the undergravel filter. Also undergravel filters were not miracle filters. Fish still got ice, water quality was not always perfect, and the filter had to be cleaned. This "modern" invention did not remove the aquarist from the aquarium and it did not provide a maintenance-free aquarium.

By the 1960's and 70's, the tropical fish hobby had grown rapidly with a number of individuals starting companies that are still around today. Injection molded filters have kept costs down and the hobby was (and still is) affordable to almost everyone. But as society shifted to a more "fast-pace," hobbyists started to become a little impatient. This is not helpful to tropical fish. A newly set-up aquarium takes time to become established and one cannot add fish instantly. The tank has to "break-in." A lot of snake-oil potions and devices were marketed during this time which promised to remove the labor from the hobby. Instant bacteria for cycling the tank filter which never needed cleaning, devices which eliminated the need for water changes--none delivered their promises. The aquarist needed patience and needed to observe the aquarium.

Many of the books were written in this period about the hobby. It is interesting to note that rarely did filtration receive more than a few pages. But there were a few major books that incorporated the research findings of aquaculture and wastewater treatment into theories about how aquaria function biologically. It was during this period that many new and easier to use filters become available. The ones that were successful were the ones that made it easier and quicker for the hobbyist to clean and service them. They did not eliminate the aquarist, but they did reduce the time and hassle spent servicing the devices.

A lot of serious research was done during this time and many new fish entered the hobby. Now there were fish of almost every shape and color and aquaria became centerpieces in homes. At the same time some major public aquaria were built or refurbished. The New England Aquarium opened in Boston in 1969 and started a trend of large public aquaria that is still going strong today. The hobby also enjoyed a growth spurt during this time. Canister filters were reworked, hang-on-tank power filters became less noisy and more dependable, and in Europe the beginnings of the trickle filter took

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hold.

In the 1980's and 90's, the cutting edge of the hobby became the reef tank. This segment of the hobby took-off like a Malibu brushfire--uncontrolled and going in every direction. Companies sprang-up overnight with all sorts of equipment that one had to have to maintain a successful reef aquarium. A typical reef tank looked lost, surrounded by all the devices, filters, probes, and controllers that were "required." This was definitely high-tech and the complete opposite to the aquaria of the first part of the century which relied on nothing more than sunlight and plants. However, the average reef tank in the early period was not very successful and it turned out that the most important factor in the success of the tank was not the amount of equipment, but having the right pieces of equipment.

Thus, today the reef tank hobby has symbolically brought the hobby back full circle to the first part of the century. How? The successful reef tank of 1999 uses an abundance of live rock and a minimum of equipment. The microflora and fauna that lives on and in the live rock provides the filtration needed to maintain water quality. Whether the reef system is a Jaubert or a Berlin tank, the emphasis is on a balance between the live rock, the microorganisms and the number of corals and a very few number of fish. The most important piece of equipment is the light system--not the filter (the filter, if there is one, is a back-up). This sounds like the 1920's when there was no filter--just a light, a few fish and a bunch of plants. Therefore, we are back where we started. Today we settle on a balance between the technical components of the aquarium and the natural processes which occur when one provides some of nature's own filters.

I would like to end this article with a few "don'ts." Anyone in the hobby for even a short period of time has heard these.

Don't overfeed.

Don't overcrowd.

Don't use very deep aquaria.

Don't start with expensive fish.

Don't attempt to move filled large aquaria.

Don't fail to replace covers on tropical aquaria.

Don't always blame the dealer if your fishes die.

Don't be too sure the family cat won't fish in the aquarium.

Don't suddenly change the temperature of the water, either higher or lower.

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Don't overwork the aquarium hobby. It will last longer in moderation.

Don't allow unconsumed food to remain in the aquarium. Remove with dip-tube.

Don't fail to thoroughly disinfect an aquarium in which there has been a contagious disease.

Don't place new fishes with your established fish until certain that they are not diseased. A week's quarantine is desirable.

Don't attempt to grow aquatic plants in a very subdued light. They cannot prosper and will do more harm than good.

Don't overlook the great possibilities of the native fish aquarium, both freshwater and marine. The terrarium, too, is well worthy of attention.

Don't keep fishes in galvanized iron or zinc receptacles, nor have copper or brass in contact with aquarium water. Unseasoned wood is bad; unseasoned concrete is fatal.

The above advice is both reasonable and astute and I wish I could take credit for it, but the words were written in 1921! Yes, these "don'ts" have been around since the beginning of the modern age of aquarium keeping. Treat them as advice from your experienced grandfather. They come from the book, "Goldfish Varieties and Tropical Aquarium Fishes" by William T. Innes. So even today, with all the advances and "modern" equipment, successful fishkeeping still can be traced to a few simple words of advice from the first part of this century. Good fishkeeping!

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