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## Abstract & Introduction

Each year, 11 million ornamental fish are sold in the United States. These fish are an integral part of the American aquarium industry and the aquarium-keeping social world of private hobbyists. Aquarists keep fish, and other organisms, as a leisure activity where success is achieved through the participant's ability to not only understand biological and ecological principles, but to successfully apply them.

In this study, I conducted semi-structured interviews with aquarists to assess the potential of the aquarium hobby to develop conservation-minded, scientifically literate participants.

We have found that engaging experiences that allow people to see and care for organisms are formative experiences for future conservationists as well as future scientists.

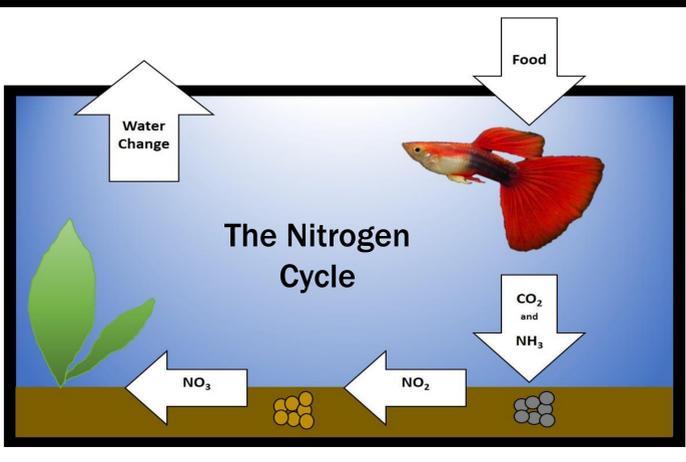
Furthermore, "Science as Leisure" is an emerging concept that could help promote stagnating fields such as natural history through education based in leisure activities.

## Methods

I became involved in the aquarium keeping social world, both freshwater and saltwater, and conducted semi-structured interviews with aquarists to assess the potential of the aquarium hobby to develop conservation-minded, scientifically literate participants.

I also utilized social media outlets, online popular media such as blogs, and aquarium magazines to search out instances of science, or "anti-science", utilized in the aquarium hobby.

## Example of Science in Aquaria



## Results



**Milton Tan; PhD candidate at Auburn University:** "There is so much that can be prevented by some basic scientific knowledge and appreciation for nature. Aquarium-keeping issues like new tank syndrome, old tank syndrome, poor fish compatibility and aggression, algae, water quality, and more are all based in scientific concepts. I also think that other big issues such as sustainability and releasing aquarium fish need to be further promoted as a whole."

**The American Cichlid Association:** This taxa-specific organization raises funds for annual grants which are awarded to research endeavors on their taxa of interest, cichlids. They award three grants yearly: the Guy D. Jordan Endowment Fund, the Paul V. Loiselle Conservation Fund, and the Stuart M. Grant Conservation Fund.



**Babes In The Cichlid Hobby (B.I.T.C.H.s):** women cichlid keepers who want to make a difference in the hobby.

"Cichlid habitats are plagued by pollution, over fishing, deforestation, hydro-electrical power projects, mineral exploitation, global warming, floods, and troubled governments. With >16 years of fund-raising, we have provided financial aid for cichlid research and cichlid conservation all over the world. We strive to widen awareness and encourage responsible cichlid keeping."

**Heather Burke; Fisheries and Wildlife undergraduate at Michigan State University:** "I was just fascinated by the variety of life forms on earth and keeping fish helped satisfy my need to interact with and explore that diversity in a controlled setting. Every time I learn a concept in school I can invariably apply it to what I've experienced in fish keeping. Chemistry for water tests, population dynamics in colony tanks, and so forth. It has piqued my interest in taxonomy/embryology since I've taken up interest in breeding fish. Lately I find myself very observant of my animals and what makes them a species."



**Brandon Rutherford; National Board Certified Teacher at Stratton Elementary School in Champaign, Illinois:** "Marine aquariums create a perfect medium for scientific study. One must understand basic chemistry, physics, and a great deal of biology. Aquarium care requires careful observation, precise measurement, and repeated experimentation. Through this study of science, students develop skills to enhance their understanding of other subjects, as well as other aspects of their lives."

**The American Killifish Association:** Another taxa-specific organization that raises funds for an annual grant, the George Maier Fund, for scientific research and associated activities that enhance the knowledge of killifish, especially as applied to their reproduction, life cycle, maintenance, nutritional requirements and food sources, biology, ecology, habitat, conservation, nomenclature and biological relationships.



**The American Livebearer Association:** Yet another taxa-specific organization. This group is deeply interested in conservation issues surrounding livebearing fish species. They run a **Species Maintenance Program (SMP)** to protect endangered livebearer species by ensuring enough club members are keeping and breeding these fish at any one time.



**Leon, a novice aquarium keeper at Stratton Elementary School:** Through keeping an aquarium in the classroom he, "has shown development in applying problem-solving skills... He doesn't give up, and keeps on track. He looks for reasons and strategies to solve problems."



## Conclusions

Through this study of the aquarium social world, it is evident that successful long-term maintenance of an aquarium is highly dependent on the skill of the aquarist. These skills include scientific principles such as aquarium ecology, chemistry, physics, biology, genetics, etc. Furthermore, freshwater aquarium clubs are financially supporting scientific research and conservation initiatives.

Evidence has shown that the newer hobby of marine fish and reef keeping is more limited in its interests in science, research, and conservation. Furthermore, they currently do not fund scientific research and are backing an industry initiative to fight the Endangered Species Act's potential listing of clownfish and 20 stony coral species.

This study shows how aquarium keeping acts as a "science as leisure" activity and promotes scientific inquiry and funds research. We have found that engaging experiences that allow people to see and care for organisms are formative experiences for future conservationists as well as future scientists.

Since 11 million people keep aquaria, it is necessary to further research "science as leisure" research in reach out and improve the scientific literacy of people from all walks of life.