

CLASSROOM ACTIVITY

Aquaculture in the Middle School Classroom

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In my twenty plus years of classroom aquarium keeping I have found that many of the learning standards we need to address can be made relevant and meaningful by integrating some form of aquaculture in the classroom. Whether its a simple aquarium or large aquaculture system, I have found that most students are fascinated by aquatic life and welcome the opportunity to observe and raise these creatures.

The science of the aquarium is the science of ecology. Lessons in biology, physical science, and chemistry can be incorporated into the maintenance and operation of an aquarium. The challenge to aquarium keeping is to mimic those conditions found in nature using mechanical devices, chemicals, and cooperative creatures. To make sure the simulated environment is safe for the residents of the aquarium involves measurement, data collection, and analysis.

In addition to good science, the aquaculture projects promote lessons in responsibility, teamwork, and stewardship. Most importantly, aquarium keeping is an exercise in creative and practical problem solving, as there are inevitable problems (teaching opportunities) that arise in even simple systems. It is rewarding to see students identify a problem in a system from their water quality data and then take the steps needed to solve it. As is often the case, I don't have a solution for many of these problems, thus we need to work together to solve it and we all learn.

I certainly do not consider myself to be an expert in this area as I am always learning new methods for aquaculture and still making mistakes. However, with each mistake I find that I am better equipped to anticipate a potential problem and take the necessary precautions to prevent it. Its nice to see this ability develop in my students as we carry out our projects.

It would be nearly impossible for me to share all that I have learned in this contribution to "F & J."

However, I thought that I would summarize in this issue the project that I do with my seventh graders and I would like to offer some basics I have learned on aquarium filtration to which apply to any system. I would also like to thank those who have helped me to implement aquaculture in my classroom especially Brandy Wilbur and Sarah Hammond with MIT Sea Grant's Aquaculture Education Programs.

The Aquaculture of Winter Flounder in a Recirculating Aquaculture System

The seventh-graders at Swampscott Middle School have been working with M.I.T. Sea Grant's education outreach program since 2003 in the aquaculture of Winter Flounder.

Like many of our commercially valuable saltwater finfish, Winter Flounder populations are in decline due to pollution and overfishing. The aquaculture of these fish is one way to help restore their populations.

Our students have conducted several projects involving aquaculture of Winter Flounder, *Pleuronectes americanus* in a recirculating aquaculture system. It has been a great opportunity for our students to learn experimental design and experience the scientific process in a real and "hands-on" manner.

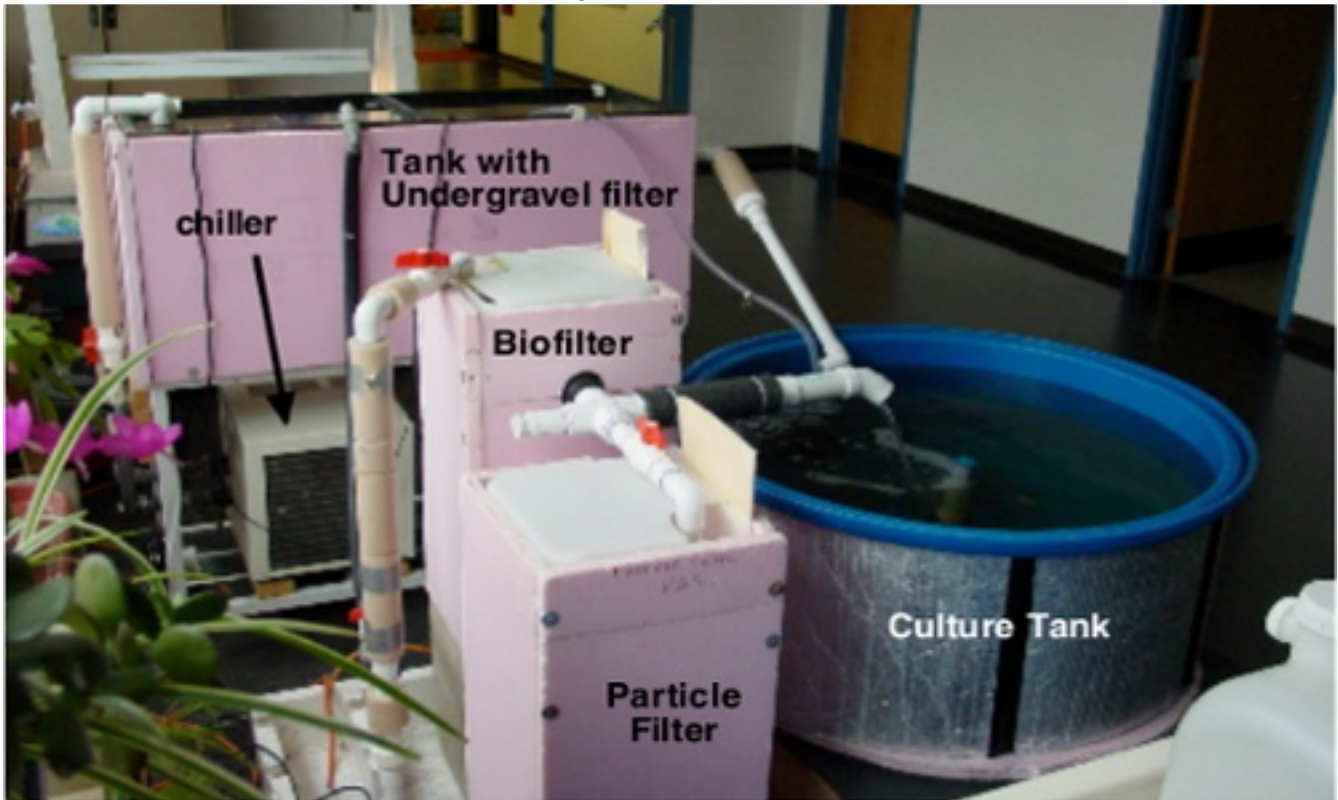


(Aquaculture Act - cont on page 23)

The Winter Flounder are raised in a chilled recirculating aquaculture system or "R.A.S." designed by aquaculture specialists at M.I.T. seagrant. See an animation of the system at the link below.

<http://seagrant.mit.edu/education/resources/recirc.html>

The following are photos of our R.A.S.

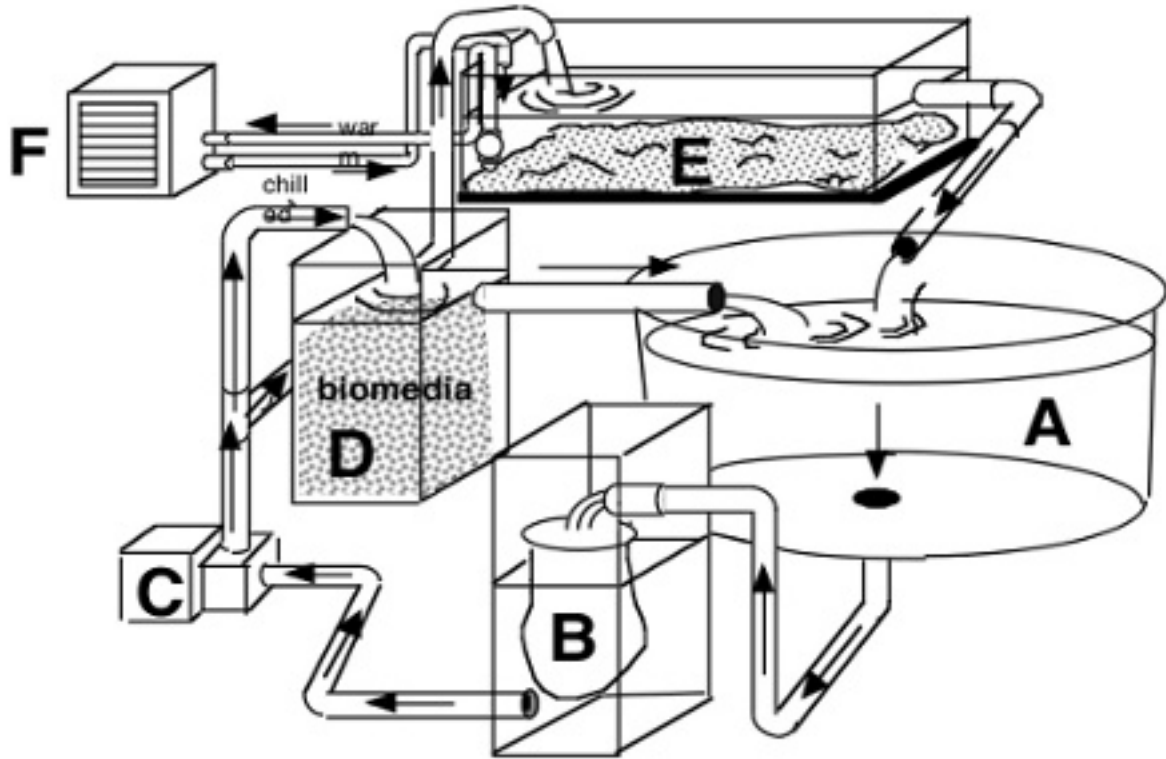


Particle Filter. Water from culture tank passes through filter bag removing particles down to 100 microns in size.



Bio-filter. Water is pumped here where bacteria growing on thousands of plastic pellets "biomedia" convert harmful ammonia from fish waste safer nitrogen compounds.

Illustration of the R.A.S.



(A) Culture or Habitat Tank (B) Particle Bag Filter (C) Circulation Pump
(D) Biofilter (E) Undergravel Filter Tank (F) Chiller



Water leaves the biofilter and returns to the culture tank after passing through the undergravel filter tank, which serves as an extra culture tank as well as another biofilter in the system.