Engineered Aquaculture Ecosystem for Managing Wastewater (2003-004)

Aquaculture ecosystem for recycling waste nutrients to reduce eutrophication and greenhouse gasses

Market Overview

This aquaculture ecosystem utilizes low RPM paddlewheels to control water flow rate and feed fish waste to algae to reduce eutrophication effects. For every ton of fish produced as much as 66 kilograms of nitrogen waste and 10.5 kilograms of phosphorus waste are produced. The waste feeds plankton and algae, and in excess can lead to blooms and then eutrophication and dead zones. Researchers have developed a method for reducing fish waste output using algal growth basins originally developed for wastewater treatment. In tests the Partitioned Aquaculture System (PAS) farmed catfish as the target fish and tilapia as secondary fish to consume algae that fed on waste, significantly reducing nitrogen levels.

Application

Aquaculture; waste treatment

Stage of Development

Prototype

Advantages

- PAS uses low-energy paddlewheels, reducing power costs
- Increases algal photosynthesis levels, potentially increasing the PAS carrying capacity
- Tilapia co-culture reduces potentially toxic bluegreen algae, allowing more populations of green algae

Technical Summary

PAS uses the concept of high rate algal growth originally developed for wastewater treatment to manage aquacultural byproducts that could lead to eutrophication. Tests have shown that ammonia nitrogen levels peaked at two to four ppm in PAS, a significant reduction from the over sixteen ppm when using a competing method at similar feed rates. The algae responsible for the reduced nitrogen also photosynthesize, recycling oxygen that increases the carrying capacity of the aquaculture farm. When a target fish is paired with an algavore like tilapia, it is easier for preferable green algae to flourish. PAS increases fish yields and decreases eutrophication potential, allowing for more environmentally conscious, efficient fish farms.

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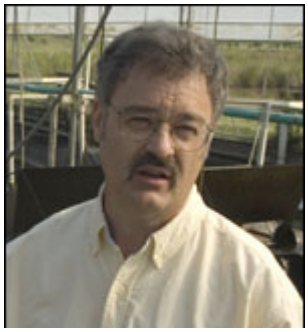
App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Utility	United States	10/929,331	7,258,790	2003-004	David Brune, John Collier, Arnold Eversole, Thomas Schwedler

About the Inventors



Dr. David Brune was a professor at Clemson University in the school of Agricultural, Forest, and Environmental Sciences. Currently he is a professor in the department of Agricultural Systems Management at the University of Missouri. In 1978 he received his Ph.D. in Agricultural Engineering from the University of Missouri. Dr. Brune started his research into aquaculture systems in 1987 and worked on PAS for nearly 20 years at Clemson University. His interests include algal culture, bioenergy engineering, and aquaculture.

Dr. Thomas Schwedler is a professor emeritus of Clemson University of the Biological Sciences department. He received his Bachelor of Science in Natural Resources from the University of Michigan in 1975, his Master of Science in Biological Sciences from Michigan Technological University in 1977, and his Ph.D. in Fisheries from Auburn University in 1980. He specializes in intensive aquaculture production management and aquatic waste management.

Dr. John A. Collier is a professor emeritus of Clemson University's Environmental Engineering and Earth Sciences department.

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