Oyster Culture is Good for the Environment

For those of us who work the oyster farms this statement has been a no-brainer for years, but proving it was another matter. Finally we are staring to get some scientific proof to back us up, and the environmental benefits are proving to be better than even the most ardent oyster supporter would have believed. Oysters clean the water, remove nitrogen, accelerate denitrification, enhance water clarity, promote eelgrass survival and provide excellent habitat for myriads of juvenile fish and crustaceans. All this and they taste great and are good for you too!

We have known for decades that oysters filter as much as 50 gallons per day down to 3 microns, but it was commonly assumed that most of the nitrogen that was filtered out gets released back into the environment when their feces dissolve. A newly published paper by Roger Newell and colleagues at the University of Maryland, suggests that bacteria in the sediment around oyster bars remove at least 20 percent of the nitrogen in oyster wastes through denitrification, the same process used in modern wastewater treatment plants.

"It's mind-boggling what the potential would be if we had a large oyster population in the Bay," Newell said. Oysters are seen as one of the most important species in Chesapeake Bay. Their filtering clears the water enhancing light for eel grass beds, and their reefs provide important marine habitat. Bay planners are calling for a tenfold increase in the oyster population by 2010 and will spend as much as $100 million on oyster restoration in the next decade.

Earlier work by Newell showed that historically oyster populations had a capacity to filter the entire Chesapeake Bay in three to six days. Newell acknowledges that most of the nutrients filtered from the water by oysters are recycled back into the water column, but the flux of undigested plant matter to the sediments stimulates bacterial processes known as nitrification and denitrification; the processes of turning the fertilizer ammonia into nitrate and then into harmless nitrogen gas which escapes into the atmosphere instead of stimulating phytoplankton blooms.

The findings suggest that if a big oyster population could be restored, it could play an important role in helping to achieve the nitrogen reductions needed to help clean up the Chesapeake. Newell said. "You need to do everything you can do to control nutrients on the land, but then, once the nutrients get into the water column, what do you do to get them out? One way may be managing your oyster resource..."

Copies of "Influence of simulated bivalve biodeposition and microphytobenthos on sedimentary nitrogen dynamics: a laboratory study" are available Limnology and Oceanography's web site in the September 2002 issue at aslo.org/index.2

The 20% nitrogen removal rate doesn't even include the amount of nitrogen physically removed from the environment when oysters are harvested. Since oysters are 1.4% nitrogen by weight, when I harvest 10,000 oysters for my weekly deliveries to New York or Boston I am removing about 23 pounds of nitrogen and 2.3 pounds of phosphate from Point Judith Pond and shipping it out. This is equivalent to the annual output of a single waterfront homeowner!

An enterprising oyster farmer, Rich Pelz from the Circle C Oyster Ranch in Maryland has recently received a federal patent (#6,391,201) on the concept of using oysters as a biological nutrient removal mechanism. He estimates that his oysters remove 32,000 lbs. of Nitrogen and 8,000 lbs of Phosphate from the water alongside a 200' dock each year through bacterial action and some direct burial and sequestration in the sediments. He discovered that the cost of nutrient reduction by wastewater treatment plants is about $28 per pound. He is trying to convince authorities that he should be compensated for his services and would like to license the idea to other growers.

The environmental benefits of shellfish culture are even being upheld in the courts. The United States Court of Appeals for the Ninth Circuit in Washington State recently heard a case brought against Taylor Shellfish, a mussel farm in Washington state. Taylor was being sued by a group of waterfront homeowners which claimed that raft-grown mussels were polluting the water with feces and shell. The court found in favor of the Taylor Shellfish stating "...feces and chemicals exuded from live mussels have not been shown in the record significantly to alter the character of Puget Sound waters, and the record suggests instead that the mussel-harvesting operations generally purify the waters."

A "no news is good news" item can be counted as yet further evidence for the environmental benefits of shellfish aquaculture. The EPA has been drafting Effluent Guidelines for Aquatic Animal Production Facilities for the past two years. Thanks to the hard work of Dr. Mike Rice of URI, Dr. John Kraeuter and PCSGA's Bill Dewey (and others who contributed countless hours on the JSA EPA Aquaculture Effluent Task Force Molluscan Shellfish Technical Subgroup) the EPA and their consultants have concluded that shellfish aquaculture does not need new effluent limitations guidelines or regulations since shellfish "...remove nutrients (in the form of algae) from ambient waters by filtration."

Cultured shellfish are one of the few groups to get a thumbs up from the environmental groups like Audubon, Monterey Bay Aquarium's Seafood Watch and Eco-Fish. These groups are trying to use consumer education to focus seafood buyers away from overfished species or species whose harvest has deleterious impacts on the environment. Shellfish and catfish are the only two cultured fish that make these groups' green list. A few years ago these groups had shellfish in the yellow "proceed with caution" category, but I have been on a personal crusade to ensure that these groups are aware of the best available science and they eventually saw the light!

And finally, URI graduate student Brian Kilpatrick compared the abundance and diversity of organisms congregating around eelgrass with those on my oyster cages at Moonstone Oysters' site in Point Judith Pond. His thesis work showed that the abundance of small fish, crustaceans and invertebrates in the oyster cages was about ten times that in the eelgrass beds, and that the diversity indices at the two sites were about the same. He counted thousand of fish, crabs and lobsters in our cages, including hundreds of juvenile tautog, black seabass and other commercially important species. Brian hopes to present his findings at the International Conference of Shellfish Restoration this fall and should have a manuscript published this winter.
I knew it all along.... RBR

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