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A surprising benefit of oyster reefs in the Chesapeake Bay

Posted on **March 11, 2013** by **serchomeschool**
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Oysters, though not the most charismatic of marine organisms, are said to be "ecosystem engineers" as they are essential to building and maintaining healthy and functioning marine ecosystems while also providing fisheries resources. Oysters often form reefs that not only provide habitats for other organisms, like mussles, clams, shrimps and crabs, but they are also breeding areas for commercially important fish species. In addition, oysters are known for their water clearing capabilities as they filter feed algae out of the water. However, when oysters consume algae, they excrete a nitrogen based waste product, ammonia, and the fate of this nitrogenous waste product is uncertain.

Nitrogen is an element that when in excess can cause algal blooms in coastal waters. In turn, any algae that remains uneaten sinks to the bottom, where bacteria acts on it, resulting in oxygen deprived areas. Though oysters are essential to the health of ecosystems, scientists want to know what happens to the ammonia excreted by oysters. The answer is a surprising one, and it comes from scientists at the Virginia Institute of Marine Science who were conducting research on the Choptank River located on the Eastern shore of Maryland. Dr. Lisa Kellog and her colleagues have determined that oysters have the ability to denitrify, or get rid of nitrogen, in the Bay. On the Choptank River she found that one acre of healthy oyster reef could remove 534 pounds of nitrogen per year through denitrification, which is one of the highest rates in any natural system in the Bay, and one of the highest in any marine environment. Denitrification is the process by which bacteria that are living in the presence of free oxygen convert ammonia to nitrate, which is then converted to nitrogen gas by other bacteria living in an anoxic (oxygen deprived) environment. Kellog describes oyster reefs as "denitrifying machines" as oyster reefs have a multitude of microhabitats for both types of bacteria and provide the bacteria with huge amounts of nitrogen rich material to denitrify.

This has huge implications for oyster reef restoration in the Bay. Kellog claims that if all the reefs in the Choptank were rehabilitated, they could remove around 50% of the nitrogen inputs into the river. However she cautions that the results from the Choptank are probably on the high end, and denitrification rates may differ among oyster reefs based on the characteristics of the reef, including oyster density and water depth. The study reef had over 100 oysters per square meter, a high figure when compared to most restoration projects. The reef was also in deeper water. Future work is looking in to the denitrification rates of oyster reefs in shallower or even intertidal waters.

Though the denitrification power of oyster reefs is just beginning to be studied, we are reminded of the many benefits of this sessile, rock-like organism. Not only do they provide habitat, and improve water quality, oysters and the associated reefs may have an important role in denitrification, which could mean improved water quality in the Bay. With future research and restoration efforts, we may be looking at more surprises from the lowly oyster!

Resources:

"Ability of oysters to denitrify Bay surprises scientists" by Karl Blankenship, Bay Journal:
http://www.bayjournal.com/article/denitrify_ability_of_oysters_to_denitrify_bay_surprises_scientists

For more information on oysters, and restoration projects going on in Maryland, visit the Oyster Recovery Partnership website:
http://www.oysterrecovery.org/