

Tracking Vibrio Bacteria in Great Bay

As the spring days warm, many of our readers look forward to harvesting oysters in Great Bay and enjoying their rewards on the half shell at the end of the day. However, consuming uncooked oysters can pose serious health risks, as they may contain harmful microorganisms that can cause illness and even death. To minimize these risks, managers take certain precautions like closing oyster beds in areas with high bacterial levels, and as needed due to heavy rainfall or red tide events. To remain effective, management measures must adapt to environmental and biological conditions that affect the types of bacteria that may be present. New scientific information is needed to support management decisions within this changing context.

Local scientists are focusing on one type of bacteria—Vibrio—that are naturally associated with shellfish throughout the world. Vibrio populations are most concentrated in warmer estuarine waters such as those of the Gulf of Mexico, but virulent strains of these pathogens have caused recent disease outbreaks in colder US waters, including Washington, New York and Alaska. Pathogenic vibrio species have been detected in Great Bay since the 1970's, yet their persistence, distribution, virulence, and factors affecting them in Great Bay are not well understood. Dr. Steve Jones at the University

of New Hampshire's Jackson Estuarine Lab and Drs. Cheryl Whistler and Vaughn Cooper at UNH's Department of Molecular, Cellular and Biomedical Sciences are working to fill this information gap through new research in Great Bay.

Two Vibrio species are of particular concern: *Vibrio parahaemolyticus* (Vp) and *Vibrio vulnificus* (Vv). Vv and Vp are known to exist in Great Bay from late May to early December, particularly in the tributaries and less commonly in the bay. During 2007 through 2009, the UNH team used molecular methods to identify Vibrio species in oysters, water and sediments of Great Bay. Vp was detected most frequently, in 66% of all samples, and occurred at the highest concentrations. Vv, however, was found less often (~8% of samples).

In addition to verifying the presence of Vibrio in Great Bay, scientists used novel molecular techniques to look for specific genes that would cause the bacteria to cause disease in humans. UNH students* looked for these genes in each Vibrio colony cultured. These genes were not found in samples tested from Great Bay and the Oyster River during 2007 through 2009, indicating that the presence of Vibrio species may not always pose a threat to human health. However, Jones cautions that although the pathogenic genes were not detected during this sampling period, one confirmed Vp case from Great Bay oysters was reported in the early 1990's, and the potential for future infections does exist. Bacteria can exchange their genetic material, so nonpathogenic Vibrio strains that persist in the estuary could serve as reservoirs from which new pathogens may emerge if conditions become more favorable.

Finally, the UNH scientists have investigated relationships between Vibrio concentrations and water qual-

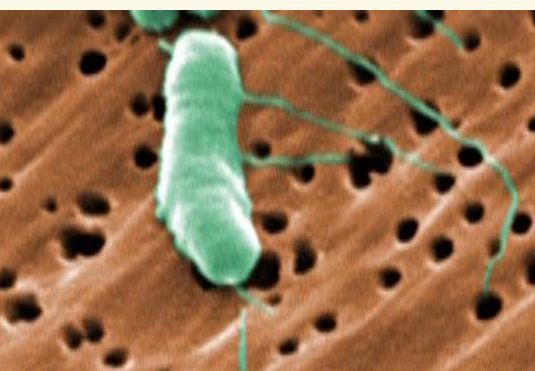
ity. Using water quality data from GBNERR's System-Wide Monitoring Program, the team observed that Vp and Vv abundances increase with water temperature. Water temperature also restricts the seasonal presence of each of the Vibrio species, with Vp detected between May and December and Vv observed only from July to September. In addition, the scientists have noted relationships between Vibrio concentrations and dissolved organic carbon, suspended solids, salinity and phosphorus concentrations. This type of information will help to inform emerging FDA requirements for more intensive surveillance of shellfish for the presence of vibrio species.

These findings suggest that the abundance of Vibrio bacteria in Great Bay, and perhaps their virulence, may be affected by broader changes in land use and climate. As development in the Great Bay watershed increases, inputs of dissolved organic carbon and nutrients to the estuary also increase. Heavy rainfall events, which are expected to become more frequent under climate change scenarios, push even more of these constituents into the estuary and reduce salinity of estuarine waters. Climate change is also expected to increase temperatures throughout the region. All of these environmental changes are associated with increased Vibrio abundance, indicating a need for new predictive tools and monitoring capacities to ensure that humans are not exposed to contaminated shellfish. As the work of Jones, Whistler and Cooper continues, their findings will provide critical scientific information needed to align oyster harvesting regulations with human health interests.

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Vibrio vulnificus

JANICE GAHR PHOTO/CDC

All Hands on Deck

The 2010 season is here and we have many reasons to be excited. We have a great schedule of kids' and adult programs, new summer staff, new exhibits in the Gregg Center upstairs and down, and interactive outside exhibits too. As we continue to grow, so does our need for volunteers.



Land use change diorama in the Gregg Center.

This season the Hugh Gregg Center will be formally opened to the public on weekends and by appointment. The new exhibits feature panels with professional photographs of various animals and birds, wildlife replicas, historic materials and general information about the flora and fauna of the Great Bay Estuary. The diorama at the back of the building features the changing landscape from the habitation of Native Americans through the later Colonial Period. Also on display is an antique map that shows the NH coast with Great Bay and the surrounding towns in the 1680's. There will be some hands-on crafts and nature projects for children to do and information on the exhibits and the green features of the building.

During the summer, the new Great Bay Special Collections Exhibit will

open in the lower level of the Gregg Center. It will feature early hunting and fishing artifacts and 19th and early 20th century bird collections that have been donated to the Discovery Center. Over the years the Center has acquired numerous books, pamphlets and documents on the local flora and fauna that will eventually be catalogued and kept here, making this a great spot for those doing research. It is hoped that people in the local communities surrounding the bay will continue to add to this collection. This unique space was made possible by a generous family donation, the Great Bay Stewards and a grant from the Wildlife Heritage Foundation of New Hampshire

We are very excited about making both of these exhibits accessible to the public but we are also concerned about staffing another building. There will be two three-hour shifts for volunteers to work in the Gregg Center during the weekends. We hope to have two people in the building so that there will be companionship and also a person to lead groups to the special collection exhibit. This means we will have eight more volunteer spots to fill on weekends. We hope to have new volunteers and summer interns that will give us a hand in filling these spots and, we will also be counting on our current volunteer crew as well.

Organizations all over the Seacoast area use volunteers to keep their programs and daily work schedules running smoothly. Many of our volunteers use their skills in helping out in local food pantries, libraries, church functions, United Way, museums, hospitals and schools in addition to spending time here. Despite the many other volunteer opportunities, we have kept our

Volunteer Spotlight

eBay Around the Bay

Where do we find some of our artifacts? Many of the items we use in our exhibits have been donated by local residents who care deeply about protecting Great Bay. We have shell collections, bird nests, salt marsh haying tools, books, photographs and art work that were all gifts to the Center. We also have items that were purchased by the staff on eBay.

For the Center, eBay has become not just an online antique market but also a reference site. We have purchased wonderful old postcards of local scenes in the estuary. We've also found old documents bearing the names of some of the areas most famous families such as the Weeks and Pickerings. Several of our books about the gundalow and local histories were eBay purchases. We often use the site to identify some of the objects we have at the Center.

An interesting way to spend some time at your computer is to type in the towns around the bay on eBay search and see the items that pop up. Maybe you will be the lucky one and find a treasure for us to put on display!

volunteer crew and added to it over the years. New volunteers bring new experiences, new ideas and helping hands to the Center. If you would like to volunteer or know someone who would, please contact Sheila Roberge at Sheila. Roberge@wildlife.nh.gov.

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