# 'Generalist bacteria' discovered in coastal waters may be more flexible than known before

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Marine bacteria come almost a billion to a cup. Until recently, however, little has been known about how these minute creatures live or what they need to flourish.

Now, new research led by a marine microbial ecologist at the University of Georgia is showing for the first time that the roles played by bacteria in coastal waters aren't nearly as specific as some scientists suspected. In fact, these bacteria are generalists in how they get their nourishment and may have the option of doing many different things, depending on what works best at the time.

While the new research confirms predictions by ecological theorists, it is among the first clear demonstrations at the experimental level that coastal ocean bacteria can act as "tidewater utility infielders," changing their functions depending on local food supply.

"If you asked me earlier how different species of coastal bacteria use their available food supplies, I would have said each species is optimized for very specialized uses," said Mary Ann Moran. "But our new research says most are carrying out multiple processes when it comes to carbon cycling."

The research was just published in the journal *Nature*. Co-authors on the paper are postdoctoral associate Xiaozhen Mou, bioinformaticist Shulei

Sun and professor emeritus Robert Hodson, all of the University of Georgia, and Robert Edwards of San Diego State University.

Learning just how everything works together in the oceans has been a daunting task, but scientists agree that it is crucial. The paper published in Nature specifically examined the metabolic capabilities of bacteria involved in breaking down organic carbon compounds.

Scientists don't yet understand much about how the various genes in ocean bacteria are packaged together. But as the ocean changes, they would like to model and predict how the processes mediated by the genes could be affected.

Only in the past 15 years have scientists been able to begin identifying the bacteria in oceans at all. Part of this is simply because ocean bacteria are notoriously hard to culture in the lab, and many can't be cultured yet at all. This makes studying them extremely difficult. New methods, however, are making such studies easier. One of them, which formed the basis for this research, is metagenomics, which bypasses the culturing step entirely by directly sequencing the mixture of bacterial genomes in seawater.

Understanding more about the genomes of bacteria has allowed researchers to ask much narrower questions than ever before, and the result has been a new ability to understand how marine bacteria live and interact in the ocean.

The research in the current study was done in an area off the coast of Sapelo Island, Ga., and while the findings about bacterial generalists may hold true for similar coastal ecosystems, researchers don't know if the same will be true in deep-ocean or other sea environments.

"We can understand a great deal about the health of the oceans by

understanding more about how the bacteria that live in our coastal waters function," said Moran.

The idea for bacterial generalists isn't new, but this is the first experimental evidence for marine coastal bacteria as generalists.

Source: University of Georgia