Every Microbe in Its Place

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Marine bacteria populations vary according to ocean conditions, say University of Southern California and Columbia University marine biologists. The finding could improve reach and accuracy of ocean-change models.

Every creature has its place and role in the oceans – even the smallest microbe, according to a new study.

Scientists have long endorsed the concept of a unique biological niche for most animals and plants – a shark, for example, has a different role than a dolphin.

Bacteria instead usually have been relegated to an also-ran world of "functional redundancy" in which few species are considered unique, said Jed Fuhrman, holder of the McCulloch-Crosby Chair in Marine Biology in USC College.

In The *Proceedings of the National Academy of Sciences*' Early Edition, Fuhrman and colleagues from USC and Columbia University show that most kinds of bacteria are not interchangeable and that each thrives under predictable conditions and at predictable times.

Conversely, the kinds and numbers of bacteria in a sample can show where and when it was taken.

"I could tell you what month it is if you just got me a sample of water from out there," Fuhrman said.

The researchers took monthly bacteria samples for more than four years in the Pacific Ocean near the USC Wrigley Institute's marine laboratory on Catalina Island.

They used statistical methods to correlate the bacteria counts with the Wrigley Institute's monthly measurements of water temperature, salinity, nutrient content, plant matter and other variables.

The researchers found they could predict the makeup of the bacterial population by the conditions in the water more than four times in five.

A majority of bacterial species came and went predictably, Fuhrman said. A smaller "wild card" group in each sample was not predictable and could represent the bacterial equivalent of weeds and other redundant plants.

"Wherever we looked, we found predictable kinds, but within the groups there were always less predictable and more predictable members," Fuhrman said.

"They're just like animals and plants in the way they function in the system. Each one has its own place."

The findings have immediate relevance for scientists attempting to understand how the oceans are changing, Fuhrman said. If bacteria behave predictably, they can be used to improve models for ocean change.

By including bacteria, which make up the vast majority of species on land and sea, "we have some hope of predicting how changes are going to happen," Fuhrman said.

Source: University of Southern California