

Investigation of Novel Bacterial Diversity in Azorean and Hawaiian Lava Caves

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Abstract

Worldwide, lava caves host colorful microbial mats. Little is known about the diversity of these microorganisms, or what role they may play in the subsurface ecosystem. White and yellow microbial mats were collected from four lava caves each on the Azorean island of Terceira and the Big Island of Hawai'i, to compare the bacterial diversity found in lava caves from two widely separated archipelagos in two different oceans at different latitudes. Scanning electron microscopy of mat samples showed striking similarities between Azorean and Hawaiian microbial morphologies. 16S rRNA gene clone libraries were constructed to determine the diversity within these lava caves. Fifteen bacterial phyla were found across the samples, with more *Actinobacteria* clones in Hawaiian communities and greater numbers of *Acidobacteria* clones in Azorean communities. Bacterial diversity in the subsurface was correlated with a set of factors. Geographical location was the major contributor to differences in community composition (at the OTU level), together with differences in the amounts of organic carbon, nitrogen and copper available in the lava rock that forms the cave. These results reveal, for the first time, the similarity among the extensive bacterial diversity found in lava caves in two geographically separate locations, contributing to the current debate on the nature of microbial biogeography.