RELATIONSHIPS BETWEEN CORALS AND MICROORGANISMS: 
CORAL-ASSOCIATED MICROBES AND PELAGIC MICROBIAL DYNAMICS IN 
REEF WATERS

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ABSTRACT

Corals form the building blocks of reef ecosystems and their high rates of productivity stem from their complex assemblage of diverse organisms including microorganisms (Bacteria, Archaea). Microorganisms are often rapid responders to disturbance, and it is important to advance knowledge about relationships between corals and microorganisms to better understand how these associations will respond to the anticipated changes in their environment. The goal of this dissertation was to advance understanding about relationships between corals and microorganisms by examining both coral-associated and reef water-associated microorganisms using modern cultivation-independent molecular and microbiological approaches. Specifically, this work focuses on describing i) the onset, localization, and specificity of microbial relationships with a healthy developing coral (*Pocillopora meandrina*) and ii) microbial dynamics in the reef waters surrounding corals, and the response of the bacterioplankton community to nutrient loading from coral spawning. These investigations led to a number of novel findings regarding coral-microbial relationships. These studies demonstrate that *P. meandrina* does not harbor internally associated microorganisms until they are at least 79 hours old. The internally associated microorganisms appear to be acquired from their surrounding seawater environment and are frequently members of the *Roseobacter* clade of *Alphaproteobacteria*. The incorporation of microorganisms by developing *P. meandrina* exhibits some specificity, and therefore may be influenced by the composition of the bacterioplankton in the seawater. A large-scale field experiment in Kaneohe Bay, Hawaii revealed that coral spawning affects the composition of the bacterioplankton community.
in reef flat and lagoon environments, but only a small fraction of the microbial community responded to the presence of the coral-produced organic matter. Consistent forcings from physical mixing may be more influential on the microbial communities than the spawning events, and may cause the observed dissimilarities in the composition and heterotrophic productivity of the microbial communities inhabiting the closely situated reef flat and lagoon environments. Future research is necessary to understand the influence of the seawater microbial community on coral-microbial associations and coral health, and this understanding is necessary to predict if and how coral-microbial relationships will endure following the effects from a changing ocean environment.