Kline, D. I., N. Kuntz, M. Breitbart, J. Grayson, G. Mitchell, N. Knowlton, and F. Rohwer. 2006. Microbial imbalances on coral reefs: anthropogenic impacts and reef decline. Eos Trans. AGU, 87(36), Ocean Sci. Meet. Supp., Abstract OS53L-06.

Abstract:
Coral reefs and their associated biodiversity are being degraded at an alarming rate. Among the most degraded reefs are those of the Caribbean, which have suffered an 80 percent decline in coral coverage over the last thirty years (Gardner et al. 2003). This research examines how anthropogenic stress affects the relationship between a coral and its associated microbial community. Coral associated bacteria are known to be diverse, abundant, and species-specific yet their role in coral health and immunity is largely unknown. In a series of experiments utilizing a custom designed culturing system (the AADAMS), we demonstrate that routinely measured aspects of water quality (nitrate, phosphate, ammonia) do not cause substantial coral mortality at environmentally relevant treatment levels. In contrast, dissolved organic carbon (DOC), which is rarely measured on reefs, does. Elevated DOC levels also accelerate the growth rate of bacteria living in the corals' surface mucopolysaccharide layer (SML) by an order of magnitude, suggesting that mortality occurs due to a disruption of the balance between the coral and its associated microbiota. Furthermore, we present data from White Band Disease type I (WBD I) transmission studies which reveal that WBD I is contagious and its transmission is likely influenced by anthropogenic stress. We also describe a new concept to exploit the convergence of modern high-resolution digital imaging, inexpensive computational power and mass storage, and advances in computer vision theory that can be used to create digital "expert systems". Our goal is to develop an effective digital imaging – computer vision system for automated reef structural ecological surveys that should allow more rapid quantification of reef health.