Do coastal current patterns influence disease susceptibility and connectivity of populations of the endangered coral *Acropora palmata* in St. John and St. Thomas, USVI?

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**Abstract**
Declining populations of *Acropora palmata* in the Caribbean Sea have generated concern and interest to understand the underlying mechanisms of disease outbreak and recovery in coral populations. Current patterns may play an important role in maintaining coral reef integrity yet understanding of small scale nearshore current patterns in the USVI has been hampered by lack of data. This project will elucidate small scale coastal current patterns around St. Thomas and St. John with a high resolution general circulation isopycnal model (HYCOM) of the region. Model verification is done using data from Acoustic Doppler Current Profilers (ADCP) deployed at key sites to the north and south of the islands. Coral disease and genotypic diversity data will be collected at four northern sites and two southern sites around St. John and St. Thomas. These sites span a range of conditions, including current regime, potential anthropogenic influences, as well as geographic separation and orientation, thus providing an excellent natural gradient of conditions. The first goal of this study is to determine whether current regimes influence the susceptibility of *A. palmata* populations to disease or whether environmental stress factors are the main mechanisms for the establishment of disease within these populations. **We will test the hypothesis that optimal current velocities reduce susceptibility to coral disease by reducing stressful conditions.** If this hypothesis is true, we predict that sites dominated by higher current velocities will have lower incidences of coral disease while those dominated by lower current velocities will have higher incidences of disease. If current patterns have no role in disease susceptibility we expect to see no correlation between current strength and disease occurrence. The second goal of this study is to determine to what degree ecological connectivity among coral populations is influenced by coastal current patterns. **We will test the hypothesis that coastal currents lead to genetic differentiation of *A. palmata* populations around St. Thomas and St. John.** While we expect all populations to be related to each other to some extent due to larval transport from the eastern Caribbean as demonstrated by Baums et al. (2005), some degree of population structure may exist due to local retention of larval propagules as a result of heterogeneity of nearshore current patterns. If coastal currents lead to genetic differentiation of populations, we expect to find some population genetic structure among our six study sites such that northern and southern populations would form separate subgroups. If coastal currents do not lead to genetic differentiation of populations, no evidence of population structure will be observed among populations tested. This is an interdisciplinary study to understand biophysical processes, merging oceanographic and genetic technology with an intensive ecological field investigation. Data collected in this study will help managers identify and protect key reefs in terms of disease susceptibility and in terms of sources of propagules for replenishment of damaged reefs. This study will also improve knowledge of nearshore current patterns with relevance to the spread of diseases and pollutants affecting coral and human health. It will provide HYCOM model output to the greater ocean modeling community both nationally and internationally. The project will also lead to improved collaboration between UVI and USGS researchers as well as to training of an undergraduate in the use of these interdisciplinary tools. All of these benefits are directly related to the VI-EPSCoR BCCR mission.