**INTRODUCTION**

Coral reef habitats are among the most biologically diverse ecosystems on the planet. They provide essential services such as protecting the shoreline, serving as vital habitat for fish and other organisms and acting as a tourist destination with economic value. The unique growth forms that provide the structural framework and rugosity of coral reefs are due to the calcification of stony corals in the order Scleractinia. Such calcification is made possible by the formation of a mutualistic endosymbiosis with photosynthetic dinoflagellates in the order Symbiodinium in which the coral host relies on photosynthate from the symbiont (Baker 2003). Nine divergent clades (A-I) exist among *Symbiodinium* spp. based on the internal transcribed spacer (ITS) region on nuclear ribosomal DNA (Stat et al. 2011). Such diversity results from a variety of factors including host species, depth and irradiance (Rowan et al. 1995). Bleaching, the stress-induced breakdown of the symbiosis via the mechanism of symbiont expulsion, has become an increasingly common phenomenon resulting from climate change. Stress most commonly results from elevated temperatures or higher irradiance (Weis 2008). By understanding the symbiont community composition, the effects of climate change may be more readily understood.

This study was conducted in Kāne’ohe Bay, O’ahu, Hawai’i, USA. Kāne’ohe Bay is the largest sheltered water body in the main eight islands of Hawai’i (Jokiel 1991). Located on the eastern side of O’ahu, Kāne’ohe Bay is characterized by an extensive fringing reef and patch reef system within the lagoon. The lagoon is often divided into three distinct sections based on a gradient of decreasing oceanic influence: North Bay, Central Bay and South Bay (Bathen 1968). A history of anthropogenic influence by means of agriculture, dredging, urbanization and pollution has caused Kāne’ohe Bay to serve as a unique habitat for coral survivorship (Bahr et al. 2015). Kāne’ohe Bay’s reefs are quite shallow; some sections can be exposed during low tides. Shallow depths, along with restricted circulation, pose negative implications for thermal stress, which has been observed in successive bleaching events in 2014 and 2015. Despite the seemingly intolerable physiognomies of the bay, there exists high coral coverage and rapid recovery rates from stress events. *Porites compressa* and *Montipora capitata* are the two dominant reef building coral species that make up a significant portion of the coral richness in the predominantly homogeneous bay. Consequently, they serve as crucial study species for the symbiont community.

*Symbiodinium* clades C and D are the dominant clades observed in Kāne’ohe Bay. Each symbiont clade has characteristic levels of stress-tolerance and physiological optima (Boulotte et al. 2016). Clade D, for instance, has shown much higher levels of thermal tolerance, yet growth rates of clade D-dominated corals can be depressed, raising questions about the cost-benefit analysis of harboring different symbiont strains (Stat et al 2013). Not much is known about the environmental factors contributing to symbiont variation however. Evidence of biogeographic patterns across latitudinal gradients, inshore and offshore reefs and even within the same reef environment exists, and the factors driving these patterns are important for understanding coral response to climate change (LaJeunesse et al. 2004; Garren et al. 2006). This study aimed to understand the spatial variability of symbiont clades in *M. capitata* across Kāne’ohe Bay given its unique environmental characteristics and susceptibility to stressful conditions.

A large sample size of randomly selected colonies at a subset of reefs throughout the bay served as a representative sample of the Kāne’ohe Bay population of *M. capitata*. Quantitative PCR was used to analyze the symbiont community composition of *Symbiodinium* clades C and D for each colony by quantification of the internal transcribed spacer (ITS2) region. While many colonies were dominated by one clade, the influence of heterogeneous mixtures of both symbionts was considered because the presence of a mixture of multiple symbionts suggests the potential for symbiont shuffling or switching in response to climate change (Jones et al. 2008). By analyzing spatial patterns and variability among the *Symbiodinium* community, we can understand the potential response of the Kāne’ohe Bay population of *M. capitata* to the increasing frequency and intensity of climate change anomalies.