**Project Status Report (7/26/16): Spatial Variability of clade C and D Symbiodinium in *Montipora capitata* from Kāne‘ohe Bay, Hawai’i**

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*Sample Collection*

To understand the spatial distribution of *Symbiodinium* clades in *Montipora capitata* across Kāne‘oheBay, Hawaii, samples were collected from 14 patch reefs and 6 fringing reef sites (Fig. 1). Patch reefs in Kāne‘oheBay will be compared to the fringing reefs to determine any differences in the symbiont clade distribution among these habitats. To date, 540 colonies have been randomly sampled at a depth range of ~0.0-7.0m. Each colony was tagged, photographed for visual assessment of color morph and sampled (~4cm fragment) from a branch on the top of the colony. A small tissue biopsy was taken from each sample fragment and stored in DNA buffer with 1% SDS for genetic analysis. The remaining fragment was then frozen in liquid nitrogen and stored at -80°C as an archive for future work and collaborative projects pertaining to the energetics and nutritional flexibility of *M. capitata* in Kāne‘ohe Bay.

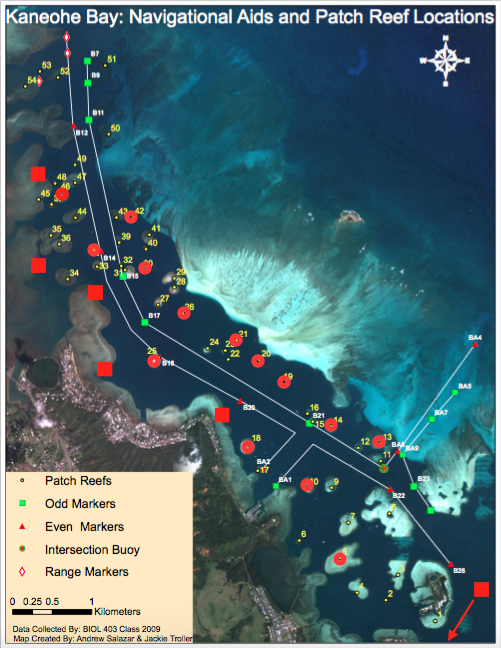


Fig. 1. Sites with tagged colonies of *Montipora capitata* at patch reefs (circles) and fringing reefs (squares) in Kāne‘ohe Bay. 30 colonies were tagged at each patch reef and 20 colonies were tagged at each fringing reef site

*Analysis and Results*

Each *M. capitata* colony sampled was categorized as either the brown or orange color morph using the *in situ* photographs. The sloping areas of the reefs from the reef crest to 7.32m had equal distributions of the brown and orange color morphs: 48% and 52% respectively. The top portions of reefs were dominated (77%) by the orange color morph (Fig. 2, p<0.001). Preliminary genetic analysis via quantitative PCR of 348 samples showed the top portions of reefs were dominated by clade D *Symbiodinium* (69% of colonies), whereas the sloping portions of reefs were dominated by clade C *Symbiodinium* (73% of colonies) (Fig. 3, p<0.001). Given that the tops of reefs showed a dominance of both the orange color morph and clade D *Symbiodinium*, the relationship between color morph and dominant symbiont clade was tested. The results showed 87% of brown colonies contained clade C as the dominant symbiont and 61% of orange colonies contained clade D as the dominant symbiont (Fig. 4, p<0.001).

Colonies were tagged at random depths to test for significant effects of depth on spatial distribution of *Symbiodinium* clades. A logistic regression showed that as depth increased, the dominant symbiont shifted from clade D to clade C (Fig. 5, p<0.001). A logistic regression also showed that as depth increased, the dominant color morph present shifted from orange to brown (Fig. 6, p<0.001). These data establish an important baseline of *Symbiodinium* spatial distribution in Kāne‘ohe Bay that will contribute to our understanding of environmental factors that influence the coral-symbiont complex. A large sample size of tagged corals can be leveraged in future research to examine temporal variation in the symbiosis if *M. capitata*, particularly important in light of the increasing frequency of thermal stress events associated with climate change.



Fig. 2. Proportion of *M. capitata* colonies with different color morphs per reef area (n=540)



Fig. 3. Proportion of *M. capitata* colonies with dominant symbiont clade per reef area (n=348)



Fig. 4. Proportion of dominant symbiont clade per colony color morph (n=348)



Fig. 5. Proportion of dominant symbiont clade as a function of depth (n=348). Left axis represents the probability of a colony to be dominated by clade D *Symbiodinium*. Right axis represents frequency of symbiont clade occurrence



Fig. 6. Proportion of color morph as a function of depth (n=540). Left axis represents the probability of a colony to be the orange color morph. Right axis represents frequency of color morph occurrence