***Exaiptasia* as a model for studying coral bleaching**

*Exaiptasia pallida* is a small sea anemone which is abundant in Florida Keys. *E. pallida* has a mutualistic symbiotic relationship with photosynthetic nutritional endosymbiont called *Breviolum* (formerly *Symbiodinium*). It is critical to recognize that there are other cnidarians e.g. Corals that are capable of undergoing similar symbiotic relationship with *Breviolum*. Unlike corals, *Exaiptasia* are easily maintained as clonal lines in the lab and can also be cultured without *Breviolum.*

*Breviolum* are microalgae which inhabit gastrodermal cells of *Exaiptasia* and provide the host with the majority of their energy budget, largely in the form of glucose produced via photosynthesis. In turn, the dinoflagellate’s photosynthetic ability is enhanced by the carbon dioxide and other molecules produced by the anemone. Most of these molecules are waste products resulting from the sea anemone’s metabolic processes. This dinoflagellate is called an endosymbiont, because it lives inside the sea anemone.

Corals around the world have been dramatically impacted in recent decades by human disturbance; we have lost more than half of the world’s living corals. Intensified by anthropogenic climate change, heat stress is one of the causes of coral decline. Heat stress results in a process called coral bleaching - the breakdown of the symbiotic relationship between corals and their nutritional symbionts. The concept for this teaching lab is to begin addressing this problem using genetics approach. The sea anemone is used as a model in experiments that analyze coral bleaching process because it is very easy to maintain in the lab and are capable of undergoing bleaching when it loses its endosymbionts.

**Aim 1**: Students will investigate the interaction of a phenotype - heat tolerance - and host and symbiont genotypes. Whereas there has been prior work comparing heat tolerance of various host/symbiont genotypes, these have largely been performed on artificial assemblages and relatively limited numbers of hosts. In this lab, we will collect naturally-occurring holobiont assemblages from the South Florida coast, spanning the waters of Miami through the Keys. Students will first assess the upper thermal limit of anemones and then identify the genotype of the host (the anemone) and the symbiont (*Breviolum*) using molecular markers.

**Aim 2:** Students will employ a forward genetics approach: students will perform a mutant screen on *Breviolum*, to identify mutants that are heat-tolerant. This is the first time that such an approach has been implemented in *Breviolum*. Using *Breviolum minutum* strain SSB01, a large clonal population of cells will be mutagenized via UV irradiation. These cells will be plated and subject to a screen, using heat for selection. Following selection, heat-tolerant mutants will be isolated and thermal tolerance further characterized. The long term goal is to identify genes critical for increased thermal tolerance.