BIOS-REU
Mentors & Potential Research Projects
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Probably the most fundamental ecosystem function in coral reefs is photosynthesis, which provides most of the energy to make the system work. Photosynthesis relies on light that has been captured by the pigments in a plant or plant community. That absorbed light energy is converted to chemical energy by a proportion called light-use efficiency (LUE). For the same light levels, a community with higher LUE will have faster photosynthesis than a community with lower LUE. Therefore, to understand how coral reefs function, it is important to understand LUE for reef communities. The aim of this research theme is to measure LUE for natural communities occurring on Bermuda’s coral reefs. There are three project components, each using a combination of boat work and laboratory activities:

- Determine community photosynthesis using moored underwater instruments that measure dissolved oxygen and water flow.
- Determine light availability and light capture using moored underwater light sensors and a diver-operated spectrometer.
- Determine reef community composition and three-dimensional structure using underwater photogrammetry (structure-from-motion).
Coral reef function: Environmental Drivers of Organism and Community Scale Metabolism

Dr. Yvonne Sawall

The key metabolic processes of coral reefs are photosynthesis and calcification, which are mostly contributed by corals and algae. Photosynthesis determines the amount of carbon and energy available to an organism or community, and calcification controls the growth of a structurally complex coral reef. Understanding what is driving these processes is of paramount importance to our understanding of how reefs function and how this may change under global change. This research theme investigates the environmental drivers of photosynthesis, respiration, and calcification rates of corals and reef communities using advanced in-situ instruments and data analytical tools.

Potential projects for the fall REU program include:

- Continuation of the time series measurements of reef community photosynthesis and respiration using the gradient flux approach and assessment of diurnal, interseasonal and interannual variations.
- Assessing the effect of mesoscale eddies on reef waters and how this affects coral photosynthesis and calcification using advanced in-situ incubating chambers.
Marine larval settlement and subsequent survival (recruitment) are processes that can control population dynamics. Understanding these processes within coral reef ecosystems is vital for determining resilience. Successful coral settlement is dependent on a suite of abiotic and biotic factors. Important abiotic factors include hydrodynamics, substrate composition, and the topography of the settlement surface, all of which can affect velocity, turbulence and boundary layer thickness. These factors, along with light levels and the environmental cues from the reef (i.e. presence of biofilms, algae, conspecifics) all affect larval behavior and settlement success. This research theme is investigating factors that negatively and positively impact coral settlement, subsequent growth and recruitment using a combination of ex-situ mesocosm experiments paired with in situ studies across different reef zones in Bermuda.

Potential projects for the fall REU program include:

- Determining the impact of environmental factors on coral larval settlement and juvenile growth.
- Investigation of substrate dynamics to enhance coral settlement.
- Assessing coral settlement and recruitment patterns across different reef zones in Bermuda.