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NEW RESEARCH IDENITIFIES POSSIBLE REASONS FOR SUCCESS OF INVASIVE MARINE SPECIES

Use of chemical inhibitors builds evidence for rapid evolution of an invasive species

Within the study of invasion biology, a main goal is to understand where the invasive organisms in a given environment came from, and the specific mechanisms that allowed them to survive in that new environment. Invasive species exist almost everywhere, but the reasons for their success in new environments are not as easily identified.

Oftentimes, the study of invasive organisms focuses on what mechanisms that allow a given individual to survive. These inborn qualities often include high reproduction rates, non-specific diets, and the ability to escape predators. However, prior research has not given considerable focus to the rapid evolution of traits that facilitate the invasion of a non-native organism. “Interestingly, there’s actually a large gap in the literature when it comes to how we think about invasive species” said Dr. Erik Sotka, when speaking about some of the motivations driving the hypothesis of the project.

Killian Campbell is an intern participating in the College of Charleston’s summer NSF REU program. Campbell’s research in Dr. Erik Sotka lab at the College of Charleston focused on a red seaweed that is invasive to the coastlines of the SE United States, *Gracilaria vermiculophylla.* This seaweed is particularly interesting because it has proliferated with high success along both coastlines of North America.

Their research focuses on the greater ecological significance of heat shock proteins, and if the population of *Gracilaria vermiculophylla* rapidly evolved after it was introduced to North America. The researchers hypothesize that the rapid evolution of a trait occurred after *Gracilaria* introduced to North America. This trait would then express heat shock proteins at higher rates, thus allowing invasive populations of *Gracilaria* to tolerate many types of stressors. Proteins inside of an organisms are at risk of denaturing, thus rendering them ineffective. Very little work has been conducted to understand how heat shock proteins can facilitate the success of an invasive species. In order to test this, Campbell subjected samples of *Gracilaria* to different stressors such

as heat or cold stress and low salinity stress with and without inhibitors that arrest the function of heat shock proteins.

In response, Campbell observed the proportion of individuals that bleached within each given treatment. Bleaching is a common stress response in photosynthetic algae, and indicated that the organism is unhealthy. The idea of the study was to observe if individuals without HSP inhibitors survived at bleached at lower raters than individuals with HSP inhibitors. If this was the case, it would underscore the important role that heat shock proteins play in tolerating stressors, and it would provide further evidence for the rapid evolution of a stress tolerance trait that facilitated the invasion of *Gracilaria.* According the current hypothesis, researchers believe that a stress tolerance gene that expresses heat shock proteins rapidly evolved in *Gracilaria* after they were produced. This allowed them to tolerate more extreme stressors and invade the new environment.

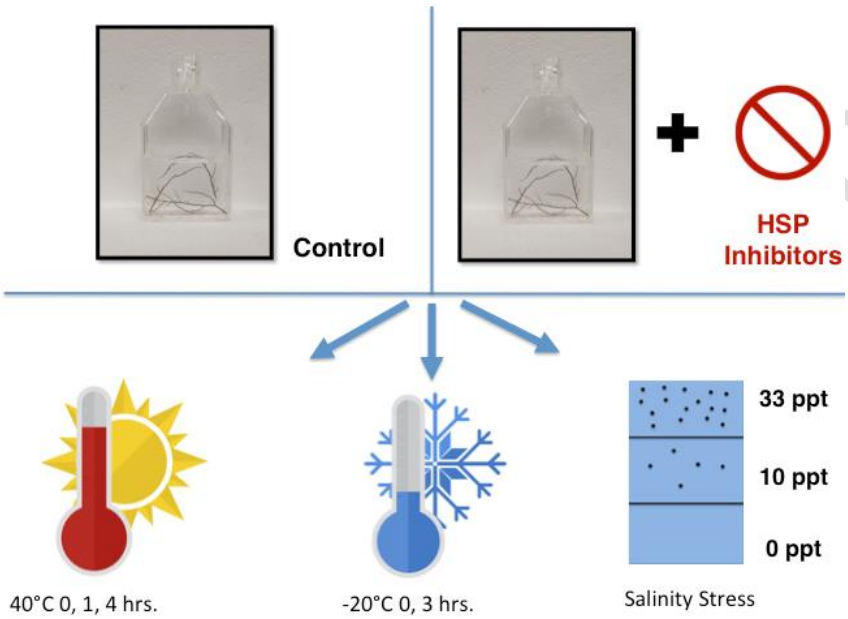

Figure 1; Schematic of different stressors samples of harvested *Gracilaria* were subjected to. 4 cm tips of *Gracilaria* individuals with and without inhibitors were subjected to the suite of stressors.

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