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Understanding the Evolutionary Dynamics behind Seaweed Invasion

Quantifying seaweed health helps to understand the role evolution plays during an invasion

Invasion of non-native species alters the health of marine ecosystems through a number of ecological mechanisms. In order to prevent future impacts of other invasive species, it is necessary to determine how existing invasive species have succeeded. Evolutionary change may be one underappreciated agent of invasion success.

In recent years, there has been a sharp increase in the colonization of coastal areas in North America and Europe by the red seaweed, *Gracilaria vermiculophylla*. This algae succeeds in its non-native range because it is more resistant to herbivores and more tolerant to temperature variation than its native populations in East Asia.

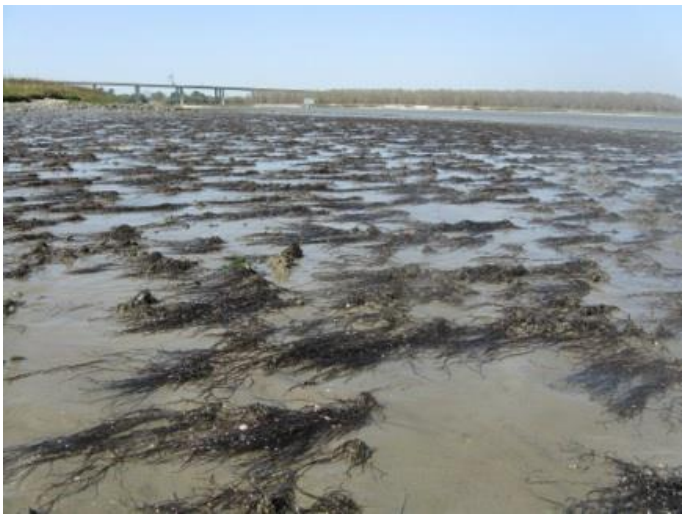
Aaron Baumgardner, of New Philadelphia, OH and an undergraduate student at The University of Akron is working with Dr. Erik Sotka at the College of Charleston to study the evolution of the *Gracilaria* invasion, and in particular to develop a new method to determine seaweed health during stress experiments.

Baumgardner uses Pulse Amplitude Modulation (PAM) fluorometry to measure a plant's ability to produce and store light energy efficiently. "The exciting thing about Aaron's research is that this 21st century tool can more accurately assess the health of plants than we can," says Dr. Sotka. "Aaron has shown that plants which look healthy are in fact dead."

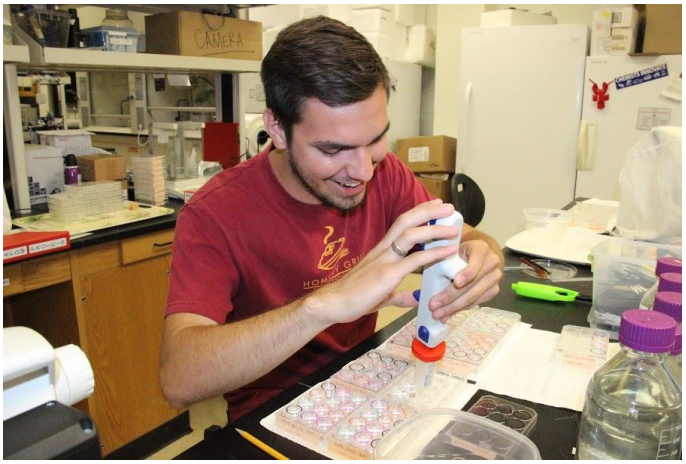
The overall goal of the research, funded in 2013 by the National Science Foundation is to detect evolutionary change in tolerance for salinity and heat stress during invasion. Evolution has been poorly incorporated into prevention and management strategies of invasive species, and this system helps scientists to develop more efficient ways to prevent future and manage current marine invasions. "We can't prevent the spread of this already ubiquitous seaweed," says Dr. Sotka, "but perhaps we can help slow the success of other invasions."

Baumgardner is one of ten selected students participating in a National Science Foundation's Research Experience for Undergraduates (REU) through a partnership with the College of Charleston. The REU program gives students the opportunity to an intense, hands-on experience in scientific research.

To learn more about Baumgardner's project visit the College of Charleston REU's blog at: https://blogreu.wordpress.com/ and to learn more about the Sotka lab visit: http://sotkae.people.cofc.edu/Home.html



G. vermiculophylla colonizes a mudflat in Charleston Harbor. Credit, Erik Sotka.



Baumgardner setting up his salinity assay. Credit, Robert Podolsky.

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