Characterizing the Feeding Behavior of *Arbacia punctulata*

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Abstract
The decline of kelp forests along the New England coast represents a significant transformation of coastal marine ecosystems, with important implications for marine biodiversity and ecosystem services. In southern New England, ocean warming and marine heatwaves have severely diminished populations of kelp over the past four decades, leading to a shift toward algal turf-dominated reefs. This regime shift has important consequences for the region's Blue Economy, as kelp forests provide critical ecosystem services including fish habitat, carbon sequestration, and coastal protection. Recent research has revealed an intriguing ecological relationship between the purple sea urchin *Arbacia punctulata* and algal communities in southern New England. Unlike other temperate sea urchin species that typically consume kelp as their primary food source, *A. punctulata* appears to preferentially graze on algal turfs over kelp. This unique feeding behavior could have important implications for kelp forest restoration efforts, as these urchins might help control algal turf communities that currently dominate former kelp habitats.

Project Objectives
This research project has two primary objectives: 1) determine temporal patterns in *A. punctulata* foraging behavior by quantifying movement rates and grazing activity during day versus night periods, and 2) assess feeding preferences by comparing consumption rates between kelp and four common turf algae species. These objectives address critical knowledge gaps in our understanding of *A. punctulata* ecological role and will provide essential information for developing effective kelp forest restoration approaches in southern New England. These experiments will be conducted at Rhode Island College and will involve field work for specimen collection.

This project will engage undergraduate students in a comprehensive research experience designed to develop both technical skills and professional capabilities. The training program will unfold across three distinct phases over the 10-week period, ensuring students develop progressively from basic skills to independent research. During the initial two weeks, students will receive training in laboratory safety, sea urchin husbandry, experimental protocols, and data analysis techniques. They will learn to use ImageJ for video analysis and establish proper data collection and management protocols. This foundation-building phase will include guided practice in scientific literature review to contextualize their research within the broader field of marine ecology. The following six weeks will focus on research implementation, with students taking increasing responsibility for conducting feeding trials, collecting video data, and performing statistical analyses using R. Students will participate in weekly data presentations and discussions, developing their ability to interpret and communicate scientific results. The final two weeks will emphasize research communication, with students synthesizing their findings into a scientific poster. They will receive focused mentoring on data visualization and presentation techniques, preparing them for the research conference.