Understanding Eelgrass and Aquaculture Interactions

Scientists and industry work together to develop improved monitoring techniques in Tomales Bay.

A unique collaboration between The Nature Conservancy (the Conservancy), the University of California Santa Cruz (UCSC), and Hog Island Oyster Company aims to fill an important knowledge gap: what is the relationship between oyster aquaculture activity and extent and health of eelgrass beds? Motivated by a need for improved monitoring of aquaculture impacts on sensitive eelgrass habitat, the team is testing the development of a cost-effective methodology that uses unmanned aerial vehicles (UAVs or drones) to monitor eelgrass-aquaculture interactions in Tomales Bay, California.

Project Background

Eelgrass is found in estuaries and provides crucial ecosystem services, including habitat for a wide array of marine invertebrates, fishes, mammals, and birds, as well as nursery grounds. Eelgrass also has the ability to modify the surrounding environment, such as by keeping sediments in place, and improving water quality. Unfortunately, eelgrass beds around the world have been impacted by human-related activities, including removal by boat anchors or propellers, development, and run-off from land activities. In California, we have lost 90% of our eelgrass acreage since the 1850s[1].

Some of California's estuaries are also home to shellfish aquaculture. California is the third largest shellfish consumer in the country, yet current in-state production meets less than half of the demand[2]. Aquaculture is a growing source of seafood globally, but traditional aquaculture activities - including boat propellers and aquaculture gear - can negatively impact eelgrass ecosystems. A lack of consistent information about the potential impacts to eelgrass limits the expansion of shellfish aquaculture in California and across the United States. Understanding the interactions between shellfish aquaculture and eelgrass health is critically important. Improved information-gathering methods will advance the industry's ability to provide high-quality, sustainable food products, while ensuring continued ecological benefits of eelgrass. Better information will also help regulatory agencies develop permit conditions that continue to protect the environment.

[1] NOAA Habitat Conservation. "Eelgrass – Habitat of the Month". National Marine Fisheries Service. Posted 10/22/2012. http://www.habitat.noaa.gov/abouthabitat/eelgrass.html
[2] California Shellfish Initiative. "A Strategy to Enhance the Marine Environment and Economy of Key Coastal Communities". Pacific Coast Shellfish Growers Association. http://pcsga.org/wprs/wp-content/uploads/2013/04/CA-Shellfish-Initiative.pdf

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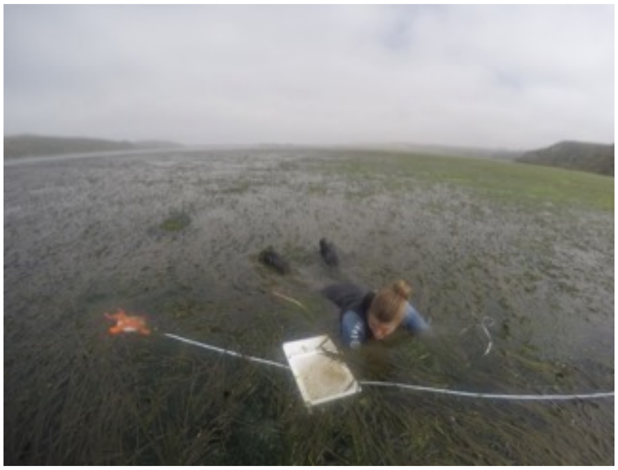
A new solution

Previously, mapping an eelgrass bed has been expensive: buying low-resolution satellite imagery, flying helicopters overhead, or performing SCUBA surveys. As a result, seasonal monitoring of eelgrass and aquaculture interactions has been nearly impossible. Unmanned aerial vehicles (UAVs) are powerful, inexpensive new tools with myriad applications for science that could offer an exciting and innovative way to improve how we monitor eelgrass. Scientists are already employing UAVs in several locations across the globe to quickly and inexpensively map kelp forests and seagrass ecosystems. Collaborators at the Conservancy and UCSC can launch a UAV near aquaculture gear and surrounding eelgrass beds in Tomales Bay, record imagery at the speed of roughly 100 acres per hour, and efficiently process the data into a usable high-resolution map within 2 hours. Eventually, staff at Hog Island Oyster Company may be able to do this, too.

Developing an eelgrass-aquaculture monitoring methodology



Pairing UAV surveys and traditional SCUBA surveys, the Conservancy, Hog Island Oyster Company, and UCSC will test the utility of UAVs in providing an accurate eelgrass monitoring methodology that can be easily adopted by industry. Then, collaborators will use this new methodology to examine the impacts of aquaculture gear on eelgrass cover to try to understand if changes in eelgrass cover are related to aquaculture, or to environmental changes through time. To elicit these impacts, comparisons will be done between sites with experimentally installed aquaculture gear, and controlled areas without aquaculture gear. Ultimately, these experiments and improved monitoring techniques will allow industry leaders and managers to have access to more data on the interactions between shellfish aquaculture and eelgrass habitats to better inform the permitting process, leading to more sustainable aquaculture and healthy ocean ecosystems.

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