

Community Science to Address Environmental Change

Connecting Schools to Community to Increase Science Capacity

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Background

Scientists have increasingly sophisticated tools and knowledge that can be used to address consequences of coastal environmental change. However, there is a gap in translating this capability into practices that can shape local decision-making. This gap creates especially difficult challenges for rural communities, where citizen volunteers are often tasked with making complicated decisions about responding to environmental change. Rural communities may also have limited access to expertise from higher education or other organizations that can assist in connecting science to local circumstances.

CSI-Maine—Schoodic Institute's "Community Science Investigations" program—which it develops in partnership with the Gulf of Maine Research Institute (GMRI), the Downeast Institute (DEI), the town of Gouldsboro, and School District RSU 24, addresses this gap by building scientific capacity in schools and connecting it to local decision-making.

Climate Change and Clams

Soft shell clam resource management has become more complex and expensive for many Maine communities because of increased predator pressure resulting from climate change.

Gouldsboro's clam management program includes the "seeding" of clam flats with hatchery clams and the use of nets to protect clams from green crabs. Gouldsboro would like to expand this work to sites that have been productive in the past but are now "dead mud." The shellfish committee wanted information about two sites – Bunker Cove and a cove at the end of Lesko Lane.



Schoodic Institute, DEI, and shellfish warden Mike Pinkham placed experiments at the two sites on May 22, 2018. At each site, 36 six-inch plastic plant pots were filled with mud, and 12 hatchery clams with a shell length of about 12 mm were placed in each pot. Pots were set at low, mid, and high tide positions. The experiments were retrieved on Oct. 23, 2018. Working pot by pot, students in Sumner Memorial High School's Pathways program separated the clams from mud using a 2 mm sieve and counted all clams including recruits. They measured the growth of the hatchery clams. Dead clams were examined to collect information about probable cause of death.

2019 Student Data Analysis

The Sumner Pathways students met weekly in January and February of this year to analyze the data and presented their findings to the Gouldsboro shellfish committee on March 20.

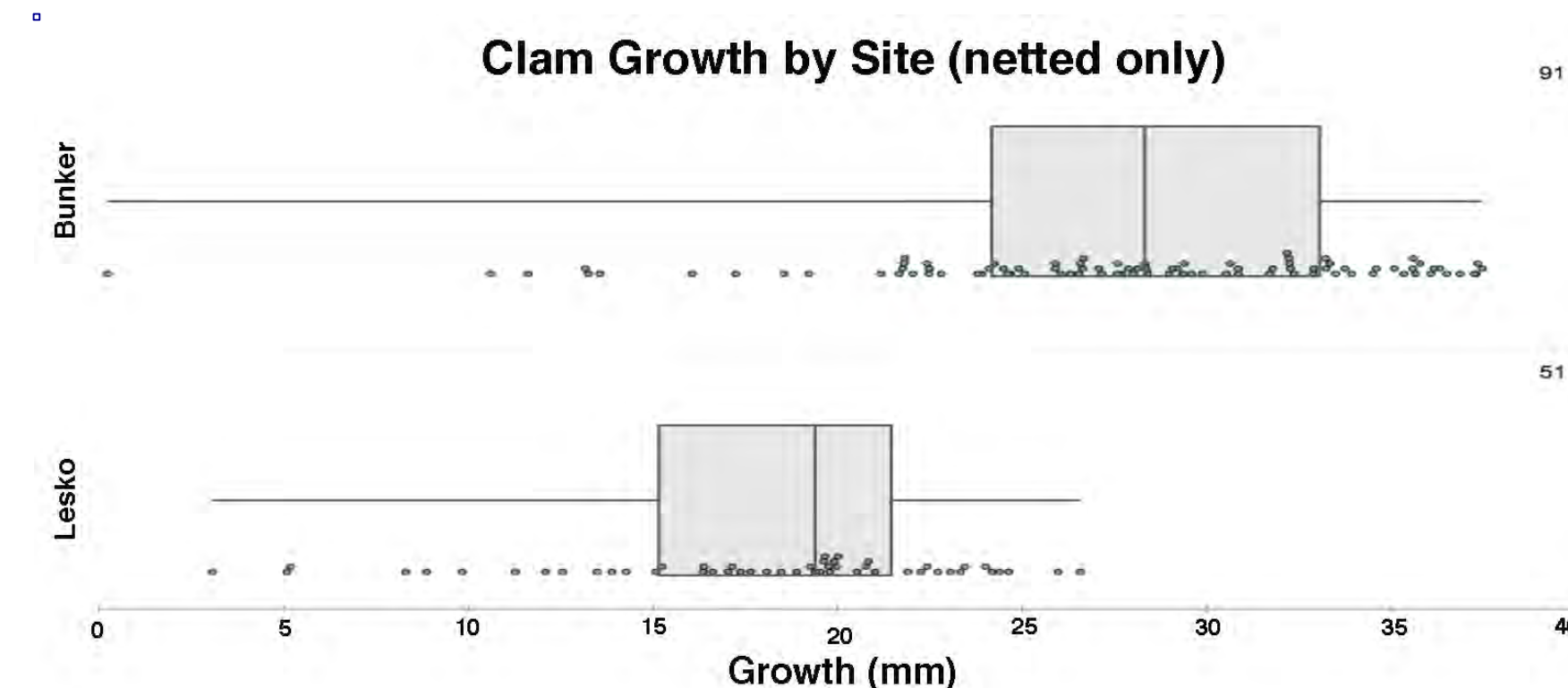


Figure 1. Distribution of clam growth at each site. Median growth at the Bunker site was 28.3 mm; at Lesko it was 19.4 mm.

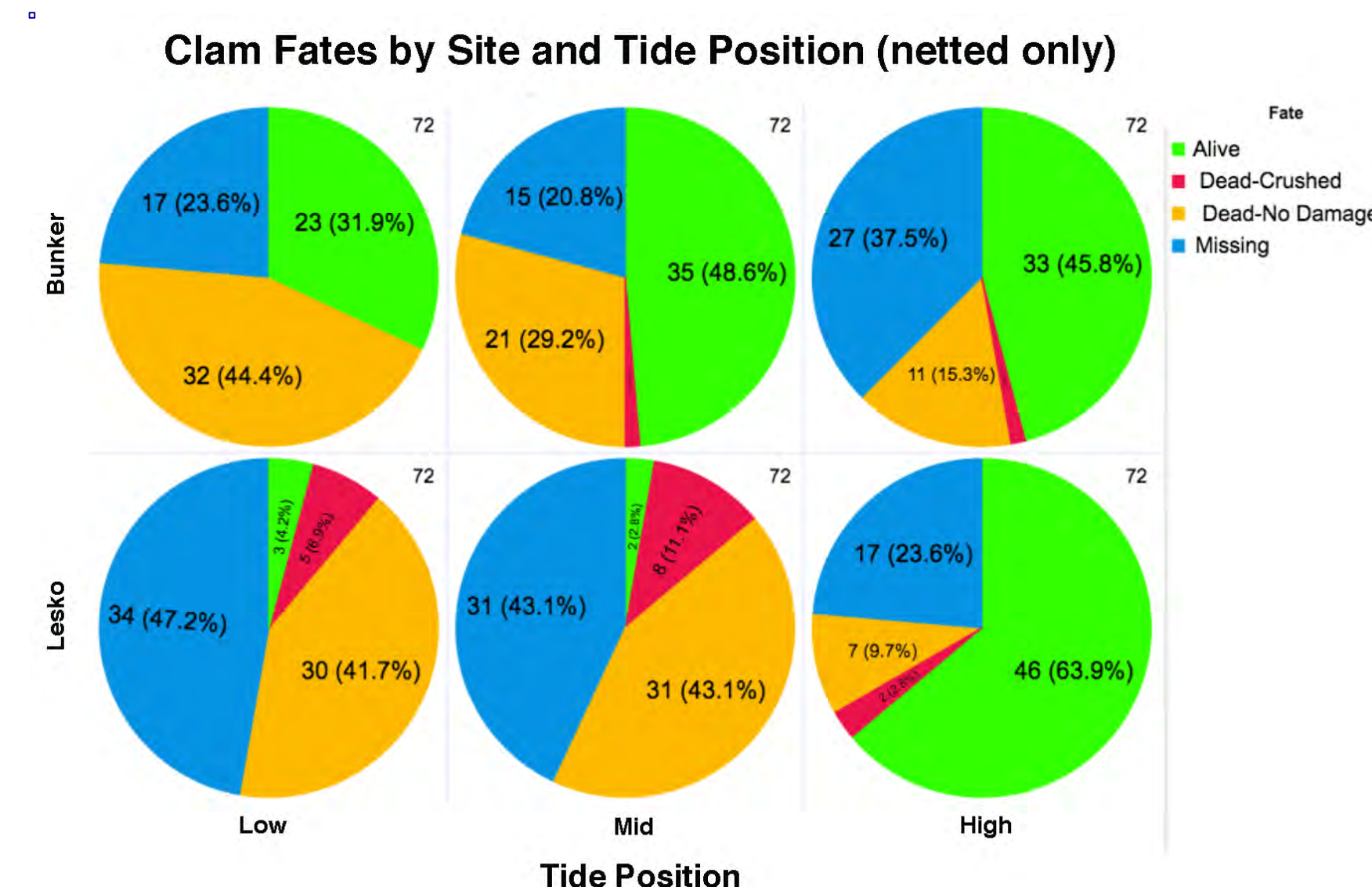
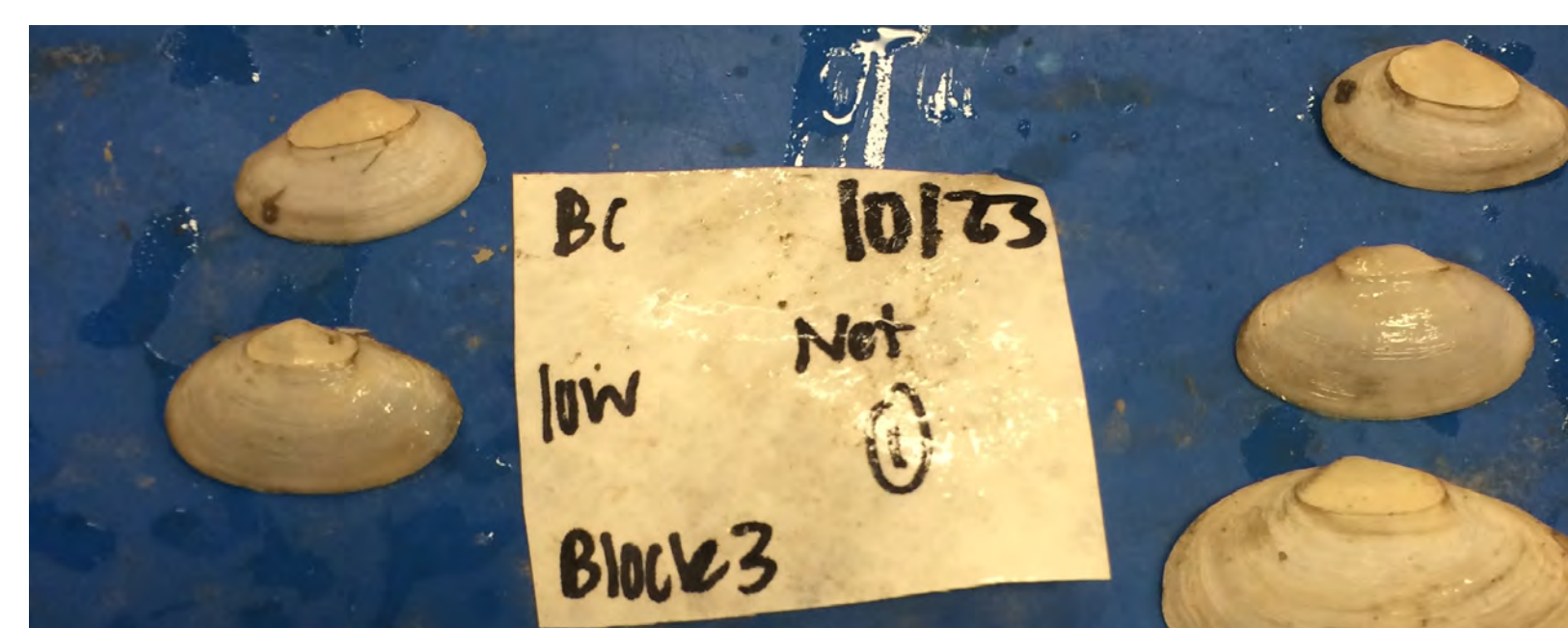


Figure 2. Clam fates at the two sites by tide position. Note that at the Lesko site, high tide appears to be the only viable location. Also note that almost half (44%) of the clams at the low tide position at the Bunker site were found dead in the pots.

The students' analysis suggested that growth and survival were likely to be better at the Bunker site than the Lesko site (Fig. 1). However, students noticed that there was an interaction between tidal position and site with regard to clam survival (Fig. 2). They were particularly concerned about the large number of dead clams found in pots at lower tidal positions at Bunker. With help from Kyle Pepperman of DEI, students retrieved photos of the clams recovered from each pot. Below are clams that were at the low tide position at Bunker Cove.



Note that all of these clams were alive long enough to grow to a size of at least twice their original shell length and in some cases much more. However, each shell was empty and uncrushed. This is the kind of clam mortality associated with milky ribbon worms.

The evidence of milky ribbon worm predation at the Bunker site and the evidence of poor growth at the Lesko site caused the shellfish committee to decide that they would not proceed with clam seeding at either site.

Outcomes: 2019-20 Work

The students' scientific work was useful in ways that went beyond initial expectations. The shellfish committee is now seeking assistance with new questions. For example, this year students will help figure out how to overwinter juvenile clams so they can be used as clam seed.

In the schools, last year's work was evidence that project-based learning can engage learners who might otherwise get left behind. RSU 24 has asked us to help them extend the CSI-Maine program to middle school students. Those students are collecting data about green crabs.



Where This Leads

We believe that science must be put to use locally.

We see our work with schools, shellfish, and the impacts of climate change as a way to build rural community science capacity to deal with environmental change.

This requires addressing and connecting the needs of different local partners. We are learning to work with RSU 24 to address their goals related to the needs of rural students. We are learning about the concerns and methods of local governments. We are learning how to support schools and local governments as they collaborate and make decisions. As we do this work, it is not just about "doing," but also about "design." We are developing tools, supports, and approaches that will be useful with other schools and communities.

Acknowledgments

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