Winter 1-17-2020

Growing with Students

John Van Dis

Growing with students

Aquaculture at Edna Drinkwater School in Northport, ME and Islesboro Central School on Islesboro, ME

John Van Dis
HS/MS Science
Islesboro Central School

Hurricane Island
Center for Science and Leadership

ISLAND INSTITUTE

DOWNEAST INSTITUTE
DISCOVERY - EDUCATION - INNOVATION

SCHOODIC INSTITUTE
AT ACADIA NATIONAL PARK

Gulf of Maine Research Institute
Science. Education. Community.

HERRING GUT
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Tuva

MMSA
Maine Mathematics and Science Alliance

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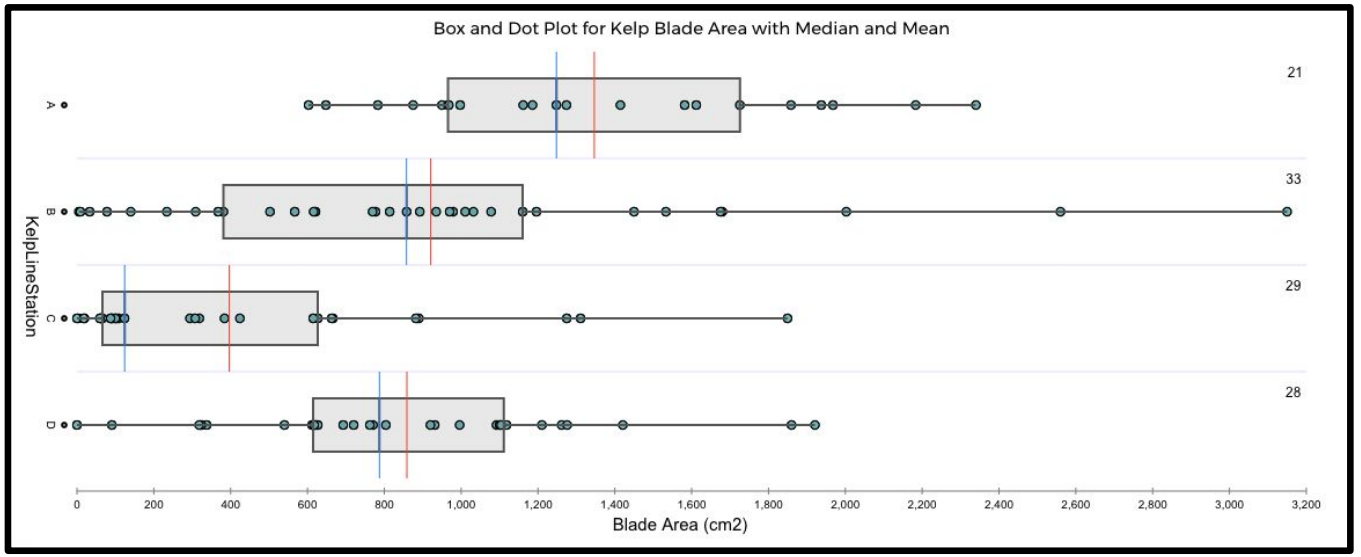
MAINE

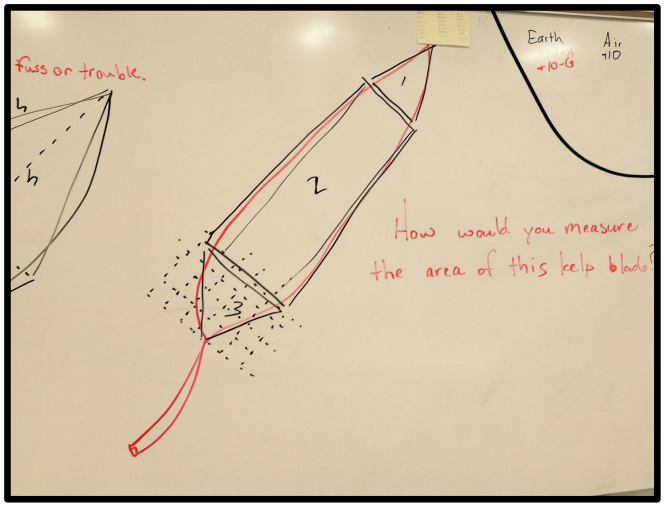
The first year

Connections

Single wrap

Double wrap





Harvest/Product

Farmers of kelp

Local preservation/conservation

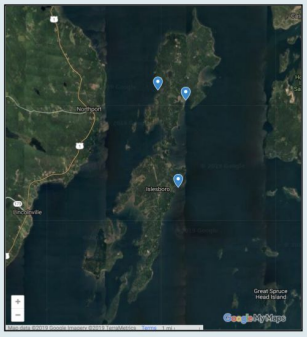
The Good, the Bad, and the Muddy: Update on Softshell Clam Research on Islesboro

Dylan Frank and Jett Lindelof
Islesboro Central School

Background

It's been harder to find soft-shelled clams these days, and the people of Islesboro have been wondering why. Recent studies have suggested that water temperature, water pH, and predation all affect shellfish survivorship, but which is affecting the clams on Islesboro? The Islesboro Shellfish Committee asked to be part of Brian Beal's ongoing clam study. Thanks to the University of Maine and the Islesboro shellfish Committee, Brian and island volunteers set up Beal Boxes on three Islesboro coves last spring. The Shellfish Committee asked students from Islesboro Central School to helped collect, count, measure, and analyze the results from the study in an attempt to see how viable the mud here really is with the hope of finding out if it is possible to rebuild the clam fishery here, or are water conditions too unfavorable for clams?

Test Sites



Methods

Using the Beal Box design developed by Brian Beal at The DownEast Institute, The Shellfish Committee placed 5 boxes at 3 tide levels at Ryder Cove, Sprague Cove, and Iselsboro Harbor on May 20, 2018. The dimensions of the boxes are 3 ½in tall, 2ft long, and 1ft wide that has a screen on the top and bottom. The planktonic clams (baby clams) settle down from the water column and go through the screen into the box where they settle into the mud. That allowed a comparison of clams surviving in the mud to those protected in the boxes. Then, on December 20, 2018, we collected the boxes and core samples at the same locations. Students at ICS counted and measured the clams in each box and core sample from the three mud flats, also taking note of crabs and other species found. The results were entered onto a spreadsheet and uploaded to TuvaLabs for analysis.

Analysis

Analysis of the clam samples suggests that water temperature and quality are not limiting factors for clam recruitment and survivorship on Islesboro as there were clams found in every intact Beal Box. There was a measurable difference in survivorship when predation was controlled for with the protection provided by the Beal Boxes. Figure 1 shows the difference in clam counts between the unprotected core samples and the Beal Boxes for each Site. Some crabs settled into the boxes along with the clams and Figure 2 shows the effect of large crabs (> 15 mm) on clam counts. As shown in Figure 3, there was no significant difference in average clam size for the boxes on Ryder Cove and Islesboro Harbor, though there were much fewer clams found at Islesboro Harbor because several boxes had washed away. Finally, Figure 4 shows the effect tidal level has on clam counts, suggesting that the low tide line has more survivorship.

Results

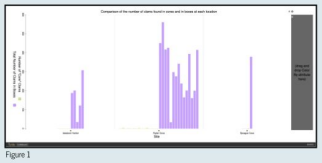


Figure 1

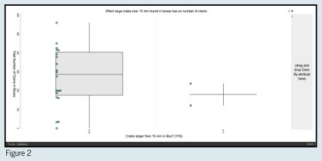


Figure 2

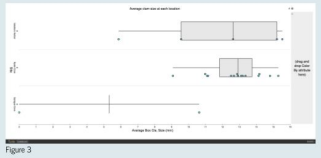


Figure 3

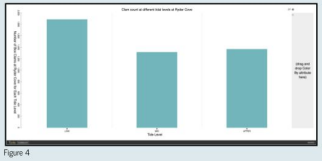


Figure 4

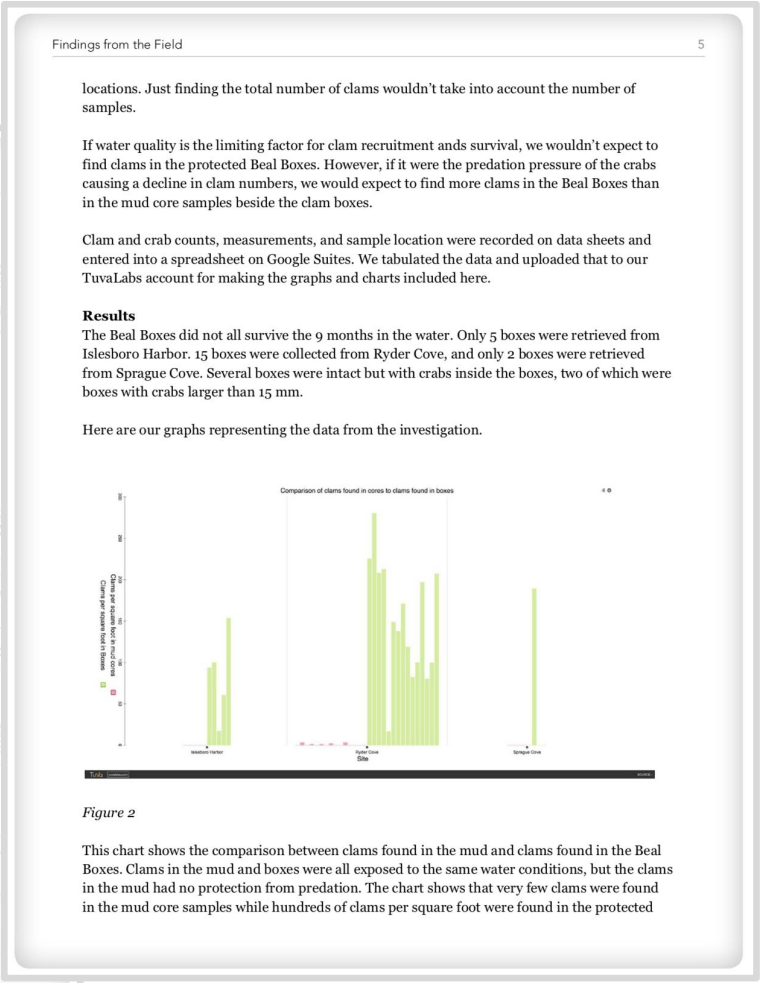
Next Steps

We will put out 30 Beal Boxes out in Ryder Cove in june, then collect them in December. We will put ten Beal Boxes at each tide level as was done in this study. Then we will keep them over winter and plant them back in the mud flats the following spring. This will help us see if the clams will grow when we put them back in the mud flats because as of right now all the clams we have collected are small. The Shellfish Committee plans on providing some sort of predation protection to prevent crabs from eating these juvenile clams. . A concern is that at Ryder Cove there were also a lot of mussels,and razor clams. That could mean that there is a lot of competition there with the clams, mussels,and razor Clams. Now our next step is to figure out a way to make the clams survive.

Gratitude

We'd like to thank the Islesboro Shellfish Committee for inviting ICS to take part in the study. We're especially thankful for the expertise, equipment, and support provided by Dr. Brian Beal. We'd also like to thank Dr. Molly Schauffler for her help in analyzing the data.

Advocacy



Findings from the Field 5

locations. Just finding the total number of clams wouldn't take into account the number of samples.

If water quality is the limiting factor for clam recruitment ands survival, we wouldn't expect to find clams in the protected Beal Boxes. However, if it were the predation pressure of the crabs causing a decline in clam numbers, we would expect to find more clams in the Beal Boxes than in the mud core samples beside the clam boxes.

Clam and crab counts, measurements, and sample location were recorded on data sheets and entered into a spreadsheet on Google Suites. We tabulated the data and uploaded that to our TuvaLabs account for making the graphs and charts included here.

Results

The Beal Boxes did not all survive the 9 months in the water. Only 5 boxes were retrieved from Islesboro Harbor. 15 boxes were collected from Ryder Cove, and only 2 boxes were retrieved from Sprague Cove. Several boxes were intact but with crabs inside the boxes, two of which were boxes with crabs larger than 15 mm.

Here are our graphs representing the data from the investigation.

Figure 2

This chart shows the comparison between clams found in the mud and clams found in the Beal Boxes. Clams in the mud and boxes were all exposed to the same water conditions, but the clams in the mud had no protection from predation. The chart shows that very few clams were found in the mud core samples while hundreds of clams per square foot were found in the protected

Restoration and engagement

Research – Scallop spat bags

fx Type

	A	B	C	D
1				
2	**Type**	**Data**	**Islesboro**	
3	Physical	Location (GPS)	☑	
4	Physical	Bottom type	☑	
5	Physical	Salinity	☐	
6	Physical	Temperature	☑	
7	Physical	Depth	☑	
8	Biological	Total # of scallop spat	☑	
9	Biological	Biodiversity	☑	
10	Biological	Species presence/absence	☐	
11	Biological	Invasive species	☐	
12	Physical	Relative current/direction	☑	
13	Physical	Fisheries data (harvesting, active, etc.)	☐	
14				
15				
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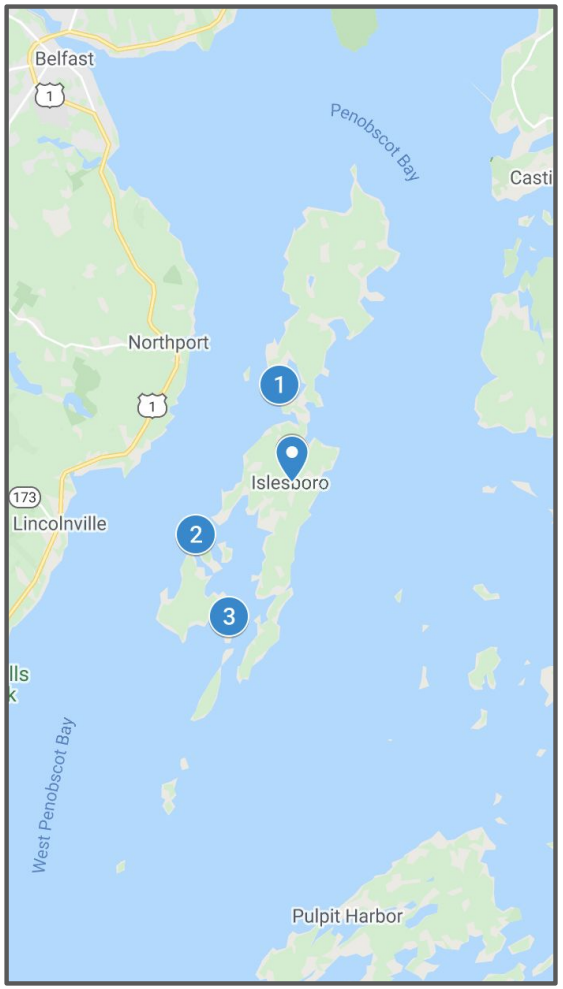
17				
18				



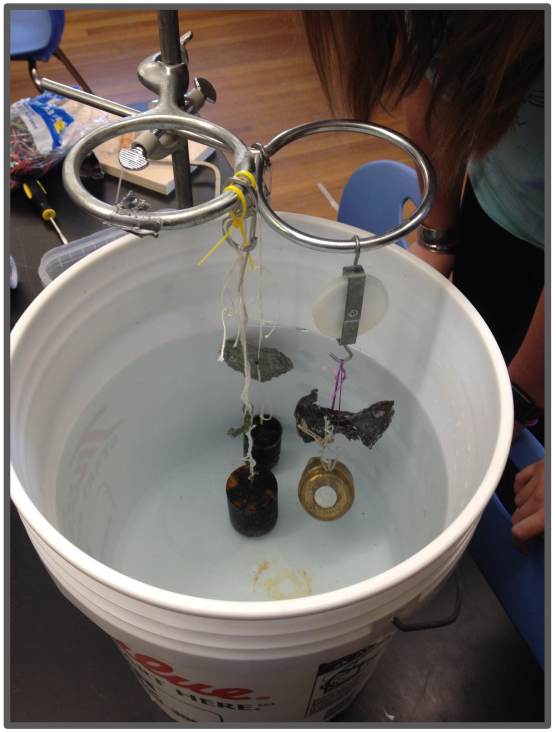
New partners – problem solving in the real world

Students are excited to tell you how they regularly do all this

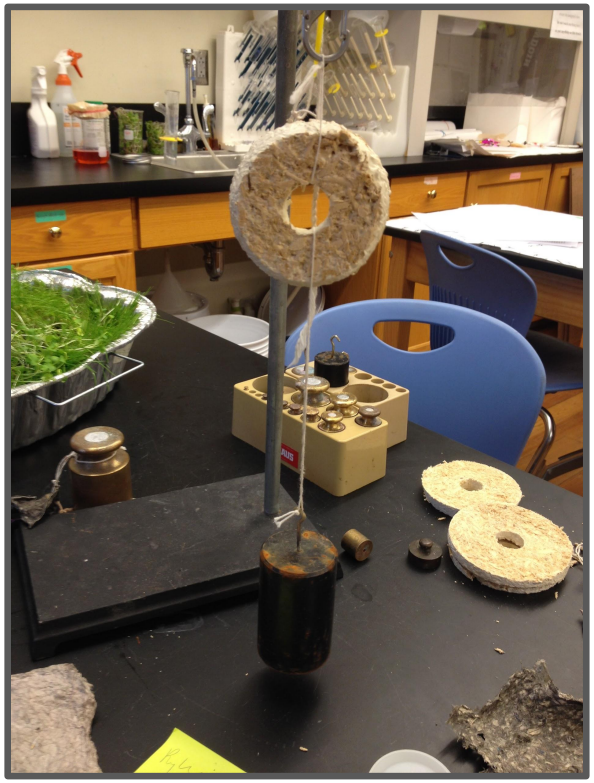
Science and Engineering Practices

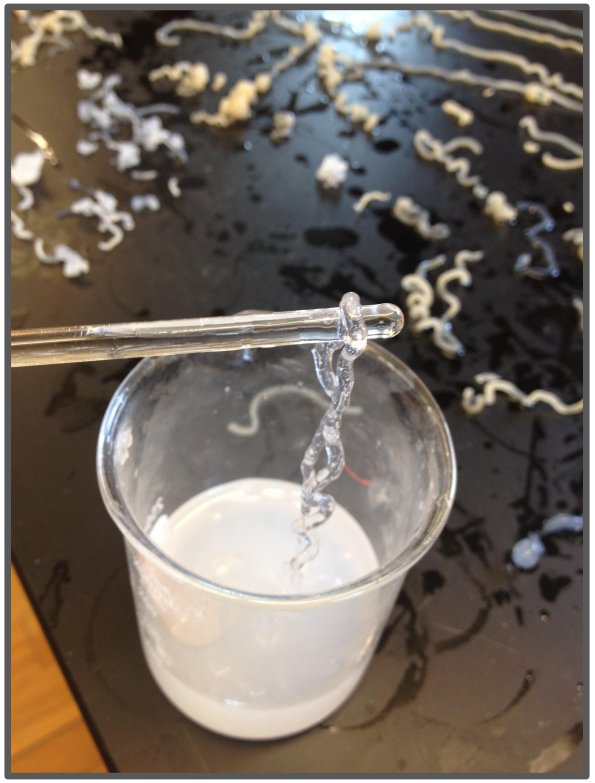
- Asking Questions and Defining Problems. ...
- Developing and Using Models. ...
- **Planning** and Carrying Out Investigations. ...
- Analyzing and Interpreting Data. ...
- Using **Mathematics** and Computational Thinking. ...
- Constructing Explanations and Designing Solutions. ...
- Engaging in Argument from Evidence.

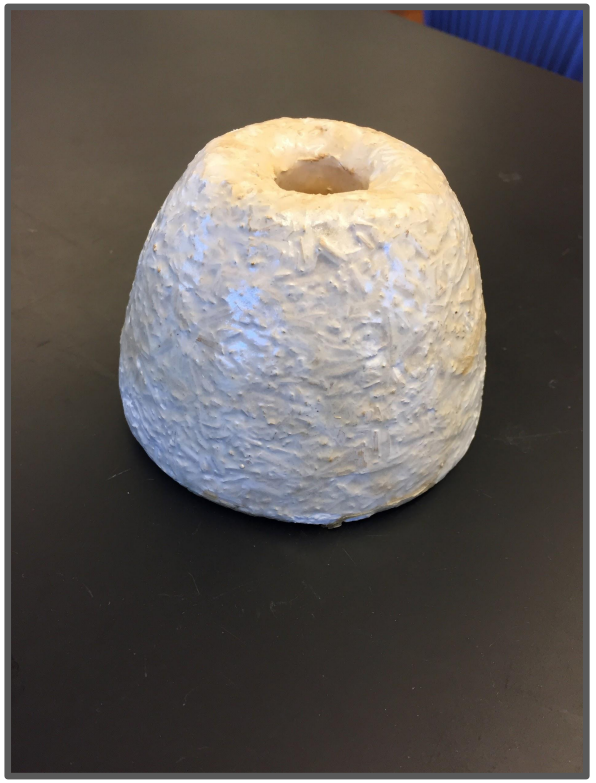
Trial and error leads to new ideas



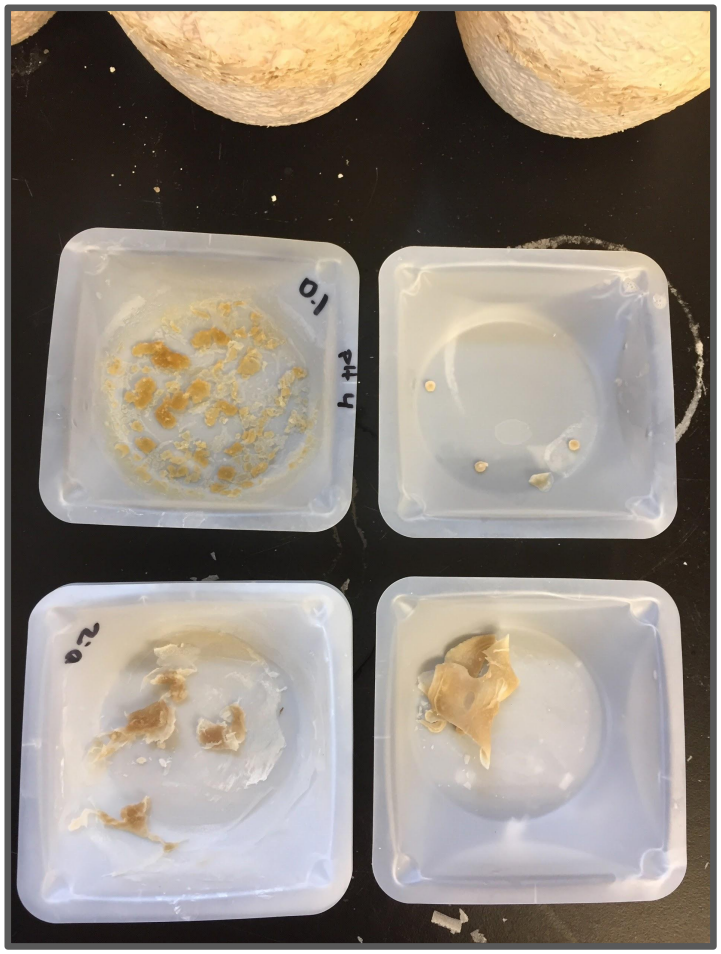
Research and Development → Bio-Inspired Design



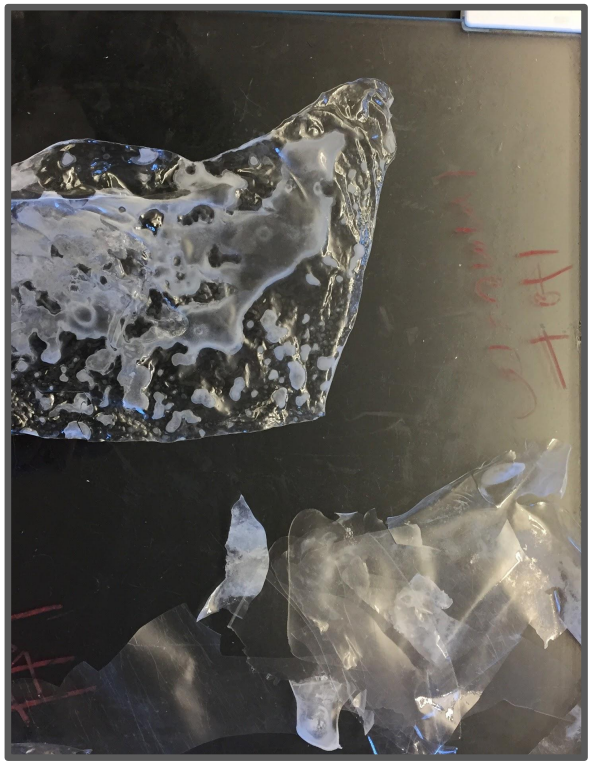




Mycelium and biofilms

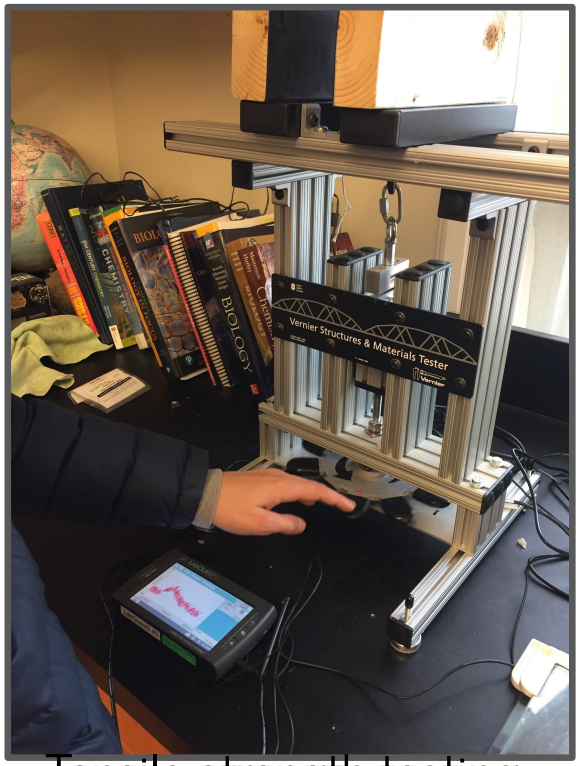


How does the method of crosslinking sodium alginate with calcium chloride affect its performance as a waterproof coating in the marine environment?



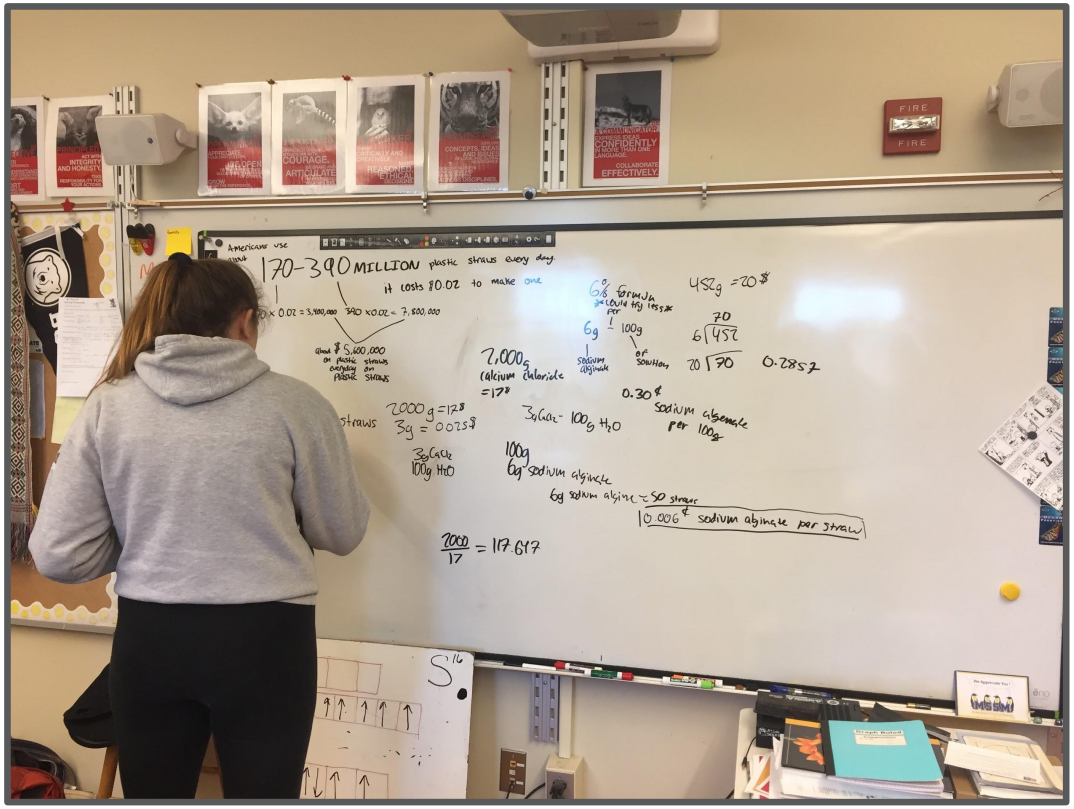
Immersion

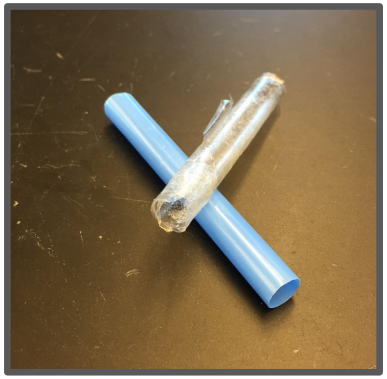
Mixing



Tensile strength testing

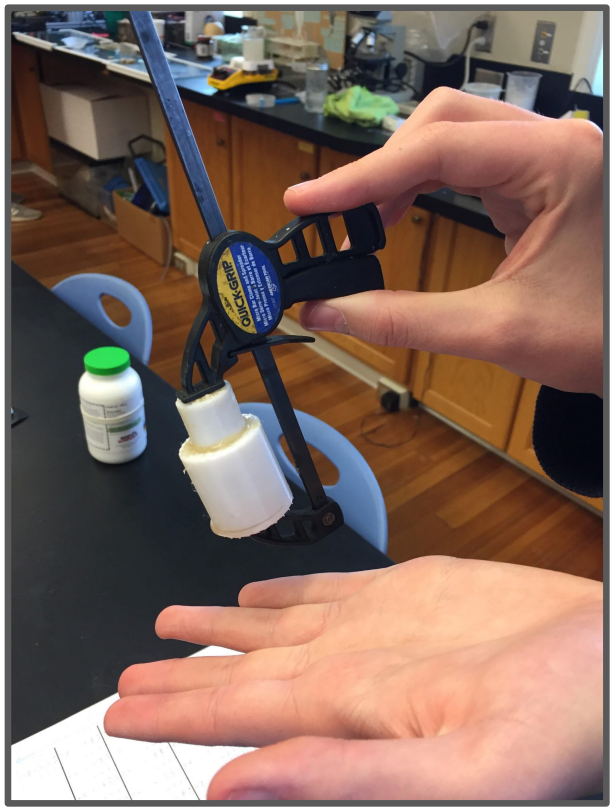
Can sodium alginate make an economic and ecological alternative to plastic straws?





Not yet

Comparing the thermal capacity of tapioca, chitosan, agar, sodium alginate, and CNF as binding agents.



Can luffa sponges replace nylon mesh in aquaculture/fishing gear?

✗

User:Vzb83

✗

https://flickr.com/photos/78725676@N06/7656713582

✓

http://flickr.com/photo/97499887@N06/9284872805

"Anyway, I suggest that you do a bit more reading and thinking about the best way to [go]." Researcher

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Things we need access to:

- Mentorship
- Journals read by industry and research
- Lab time or instrumentation
- Space on commercial/research lines
- Boat time
- Real, relevant problems to solve

In the longer run and for wide-reaching issues, more creative solutions tend to come from imaginative interdisciplinary collaboration.

Robert J. Shiller