Water Velocity Test Using LifeSaver™ Candies

Summary of the appendix of the student report by Claudia Chan, Emma Kennedy, and Vanessa Service: "Exploring the feasibility of Wizard Islet as an indicator of intertidal communities in Barkley Sound."

Purpose

This test compares the relative exposure of different sites, by measuring how water velocity degrades LifeSaver candies submerged in the water. A previous study has also demonstrated the effectiveness of this test (Sandwith, 2003), referenced in the student report.

Procedure

1) Pre-weigh each LifeSaver in its individual container, and record these values on the container and on a datasheet.
2) Attach each LifeSaver onto its own "holding apparatus" by stringing it onto the hook, followed by closing the loop. Conduct this step immediately prior to the test beginning, to prevent loss of LifeSaver mass.
3) Submerge each LifeSaver into the testing area for five minutes, just below tidal height.
4) Return the LifeSavers to their original containers immediately upon removal from the water, and allow them to dry completely.
5) Weight the LifeSavers in their original containers, and record the weights.
6) Subtract the final weight from the initial weight to determine the change in mass.

Flavour Recommendations

Pep-o-mint flavoured LifeSavers dissolve too quickly, and therefore do not remain attached to the "holding apparatus" throughout the entire test – this flavor is not recommended. However, WildCherry flavoured LifeSavers were successfully used in the previous study by Sandwith (2003). Also, the authors in this report used a combination of green and yellow LifeSavers – after determining that there was no significant difference in the dissolution rates between the two colours.

The original student report appendix follows.

Title

Exploring the feasibility of Wizard Islet as an indicator of intertidal communities in Barkley Sound

Authors

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Appendix 1: LifeSaver™ Water Velocity Test.

A LifeSaver™ test was used to determine the relative exposure between each of the sites sampled. This method has been described as an effective measure of water velocity (Sandwith, 2003). The concept behind the test is to use the mass of each LifeSaver™ candy lost after a specified submersion time to compare wave exposure among different sites. We conducted five replicates of the test at each of our four test sites.

Each lifesaver was pre-weighed in its individual container (Figure 1). These weights were recorded on both the lid of the container and on a data sheet. The "LifeSaver™ holding apparatus" consisted of a wire coat hanger straightened into a rod with one end upwards to form a small hook. A single candy was strung onto the hook of each apparatus before squeezing the gap closed to form a loop that ensured the LifeSaver™ could not slip off (Figure 2). Attaching the LifeSavers™ to the apparatus was done just prior to conducting the test; LifeSavers™ were kept in their respective containers at all other times to ensure mass was not lost during transit. Once secured, the apparatus was used to submerge each candy just below tidal height for five minutes. Immediately after removal from the water, the lifesaver was returned to its original container and allowed to dry completely. Once dry, each was weighed in its container and the recorded mass was subtracted from the initial weight to determine the change in mass.

Figure A1. LifeSavers™ holding apparatus

A previous study recommended using WildCherry LifeSavers™ to conduct the test because they come in a single flavor package (Sandwith, 2003). We were unable attain this flavor and instead used the Pep-o-mint flavor for our trial run. Although this trial was performed at a relatively low exposure intertidal site (Grappler Inlet), the Pep-o-mint LifeSavers™ dissolved too rapidly, failing to remain attached to the apparatus for the entire five-minute duration. We do not recommend use of this flavor in future studies.

We instead selected the yellow and green LifeSavers™ from a five-flavor package to determine the relationship between water velocity and mass lost. After using fluorescein to calibrate a small flume in the Fluid Dynamics Lab, we used to flume to calibrate the LifeSavers™ (Figure A2) and assess whether flavor of LifeSaver™ had an effect

LifeSavers™ dissolution. The candies' loss of mass fit a linear regression curve between mass loss and water velocity. (Figure A3). There was no significant difference between mass loss in yellow and green LifeSavers™ (F-test for equality of slopes, df=1,10, F=0.02, p>0.05, F-test for equality of intercepts, df=1,11, F=0.47, p>0.05).

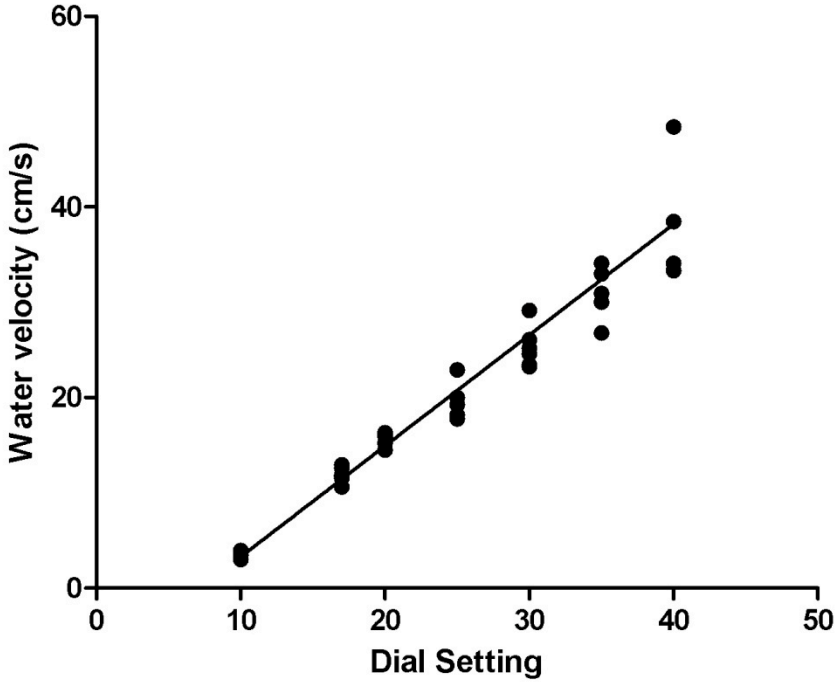

Figure A2. Change in water velocity measured by timing the movement of fluorescein in a fluid dynamics chamber

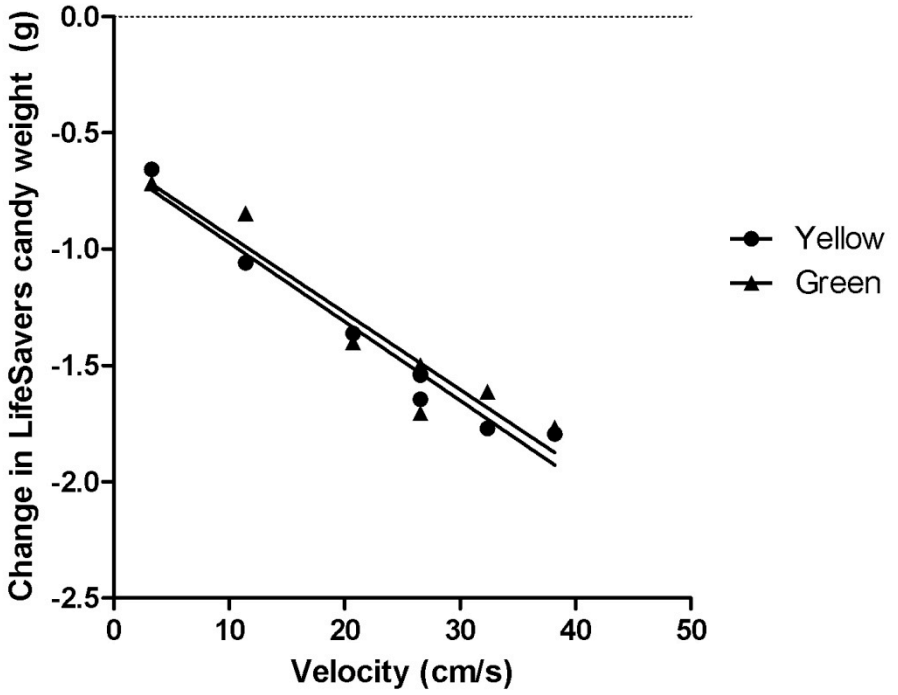

Figure A3. Change in weight of green and yellow LifeSavers^{TM} candies calibrated using known water velocities in the fluid dynamics chamber