Testing the tests: analysing and developing methods of characterizing phenotypes of *Saccharina latissima* in Nova Scotia, Canada

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INTRODUCTION

The lifecycle of *Saccharina latissima* (sugar kelp) is well understood [1], and its blade tissue can be refined into a variety of products ranging from cosmetics to livestock feed [2, 3], making the cultivation of sugar kelp of great interest.

Current cultivation practices of sugar kelp are entirely dependent on the collection of natural broodstock [1, 4, 5].

Thus, identifying and biobanking the optimal phenotype of sugar kelp is crucial to improving the sustainability of its cultivation practices in aquaculture. But first, methods of physically characterizing sugar kelp must be improved.

OBJECTIVES

1. Test current and novel methods used to characterize sugar kelp and estimate its blade biomass.
2. Develop and improve the protocols of these respective methods.

METHODS

Samples of sugar kelp were collected by Merinov and NRC associates by hand in Mahone Bay (June 2023), St. Mary's Bay (October 2023), Pubnico (October 2023), and Tatamagouche (October 2023).

Sugar kelp samples were then maintained in tumble tanks at NRC and physically characterized using 3 types of methods:

1D: metric measurements processed in MS Excel and R;
2D: photos processed in ImageJ (software) using eSnake plugin or Freehand feature;
3D: scanned images processed in CloudCompare (software);

…to estimate the blade's surface area or volume (i.e., biomass).

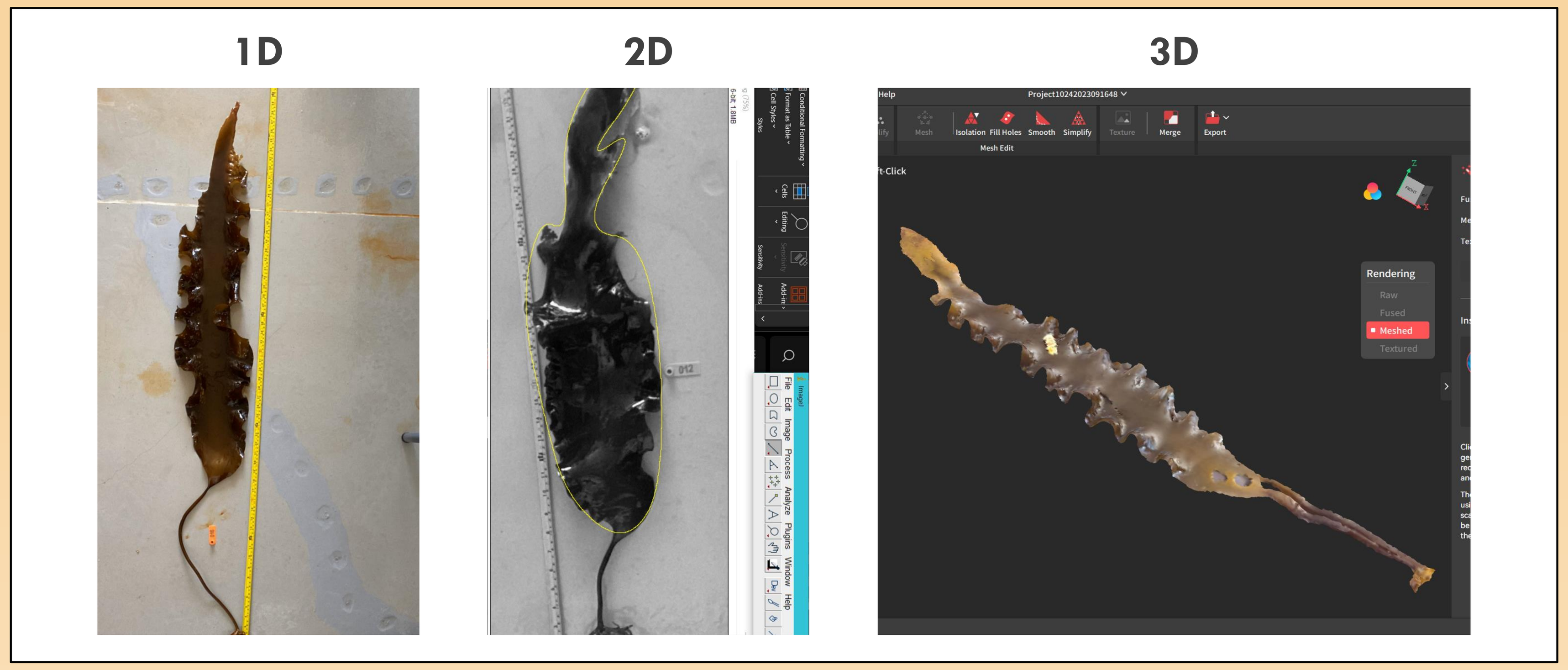


Figure 1: Images the **1D** (left), **2D** (middle), and **3D** (right) methods used to estimate blade surface area or volume of sugar kelp samples. The 2D method involved processing photos in ImageJ using the eSnake plugin (middle) and the Freehand feature, and the 3D method involved using the 3D RevoPoint Scanner and its software (right).

PRELIMINARY RESULTS

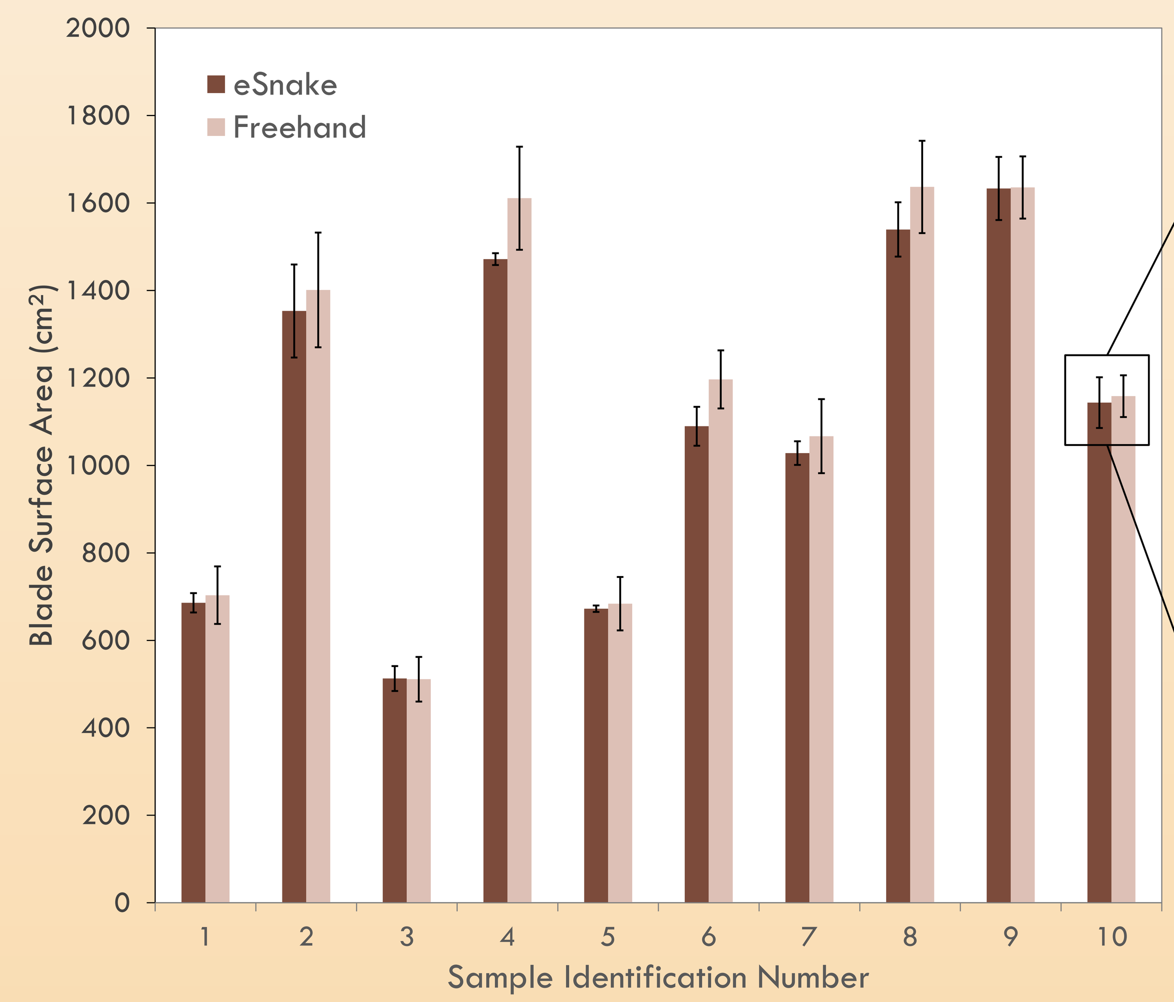


Figure 2: Mean blade surface areas (cm²) of 10 samples of sugar kelp collected from Mahone Bay in June 2023. Each sample was measured in replicates of 3. Data was processed in ImageJ, and plotted in MS Excel.

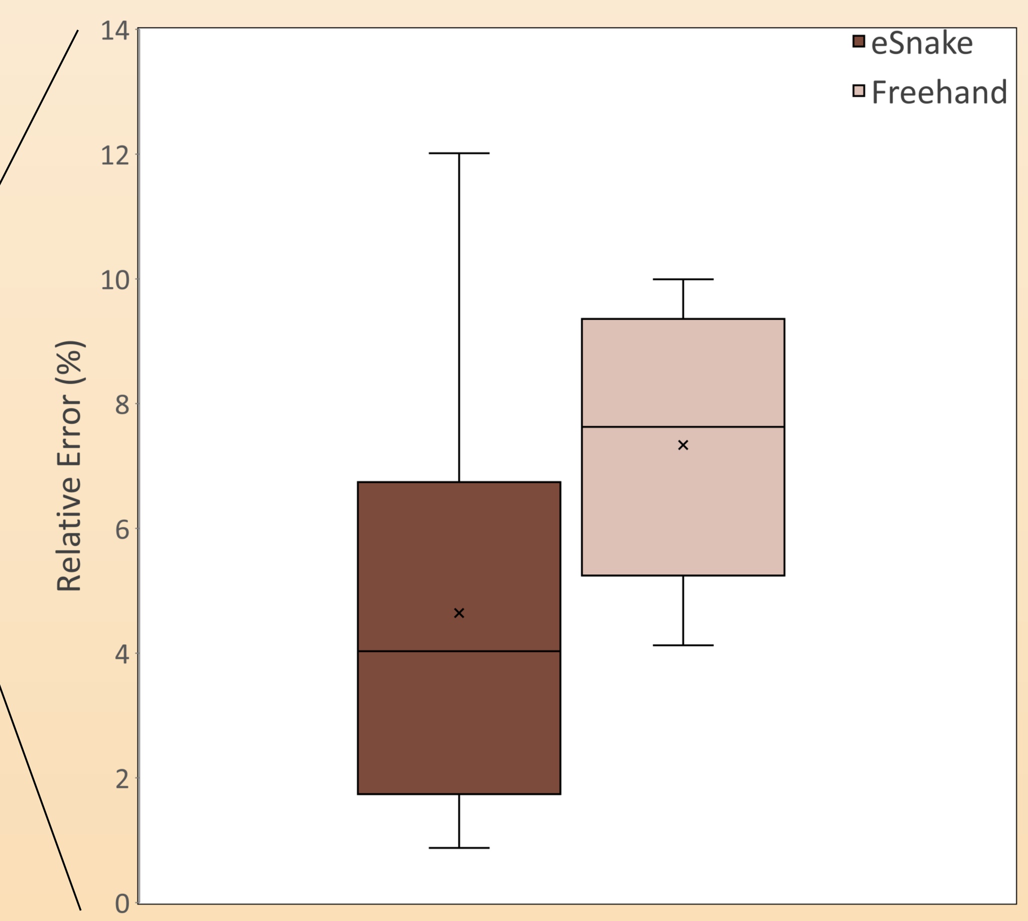


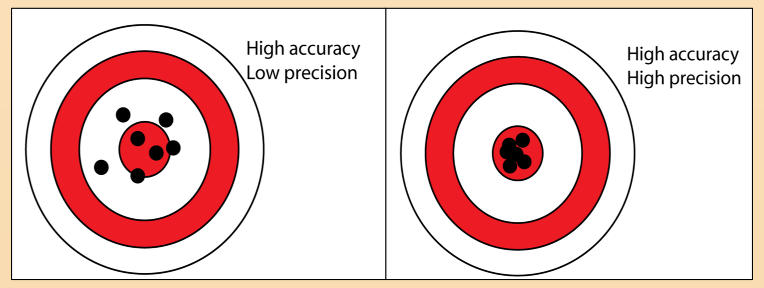
Figure 3: Boxplot of the relative errors of blade surface areas (cm²) of 10 samples of sugar kelp. Samples were collected from Mahone Bay in June 2023. Data was processed in ImageJ,and plotted in MS Excel.

Summary of preliminary results:

Blade surface area estimated using eSnake is smaller than that of the Freehand method.

The relative error of blade surface areas estimated using eSnake is smaller than those of the Freehand method.

This hints that eSnake may be more precise than the Freehand feature; statistically analyses must be done to confirm statistical significance or lack there of.



CONCLUSIONS

Biobanking is crucial to developing a sustainable and self-sufficient production of sugar kelp in aquaculture.

Preliminary data suggests the eSnake method may be more precise than the Freehand method in estimating the blade's surface area.

3D scanning and analysis is hypothesized to be the most (time) efficient and effective because of its ability to estimate blade volume.

The estimated blade surface area and volume values derived from these methods and their respective relative errors must be statistically compared in R and MS Excel using Wilcoxon signed-rank tests, and paired T-tests.

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