Nitrogen Uptake Differences Between Two Morphologies of *Ulva Compressa* In Jamaica Bay*

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***Abstract*—Eutrophication in Jamaica Bay contributes to detrimental blooms of *Ulva compressa*. This experiment compared the dissolved inorganic nitrogen (DIN) uptake of *Ulva* morphologies: blades and tubes. It was predicted that blades would uptake more because of their greater surface area to volume ratio. There were 2 control groups and 4 experimental groups, each with 5 replicates containing 100mL of either $NaNO_3$ or NH_4Cl-enriched nutrient media. Water samples taken from each flask before and after the 25-minute experiment were tested for NO_2/NO_3 and NH_3 on a nutrient analyzer. These amounts were added to find DIN uptake. Our results show blade uptake was higher than that of tubes in both nutrient media, supporting the hypothesis.**

I. Introduction

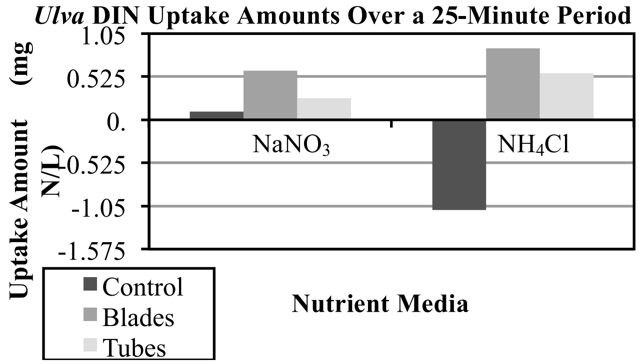
Eutrophication, a serious form of water pollution, is the excessive increase of a waterway's nutrient concentration, often resulting from sewage, chemical fertilizers, and more (Art 196). Eutrophication causes detrimental blooms of multicellular algae called macroalgae (MA). MA extracts can harm various organisms (Nelson et. al.). Dense MA growth blocks sunlight from seagrasses that provide food and habitat and creates "dead zones" with low dissolved oxygen, suffocating aquatic life. Jamaica Bay's (JB's) eutrophication augments growth of *Ulva compressa,* a green MA species that appears in two morphologies, or shapes: sheet-like blades and long, stringy tubes. This experiment quantifies and compares nitrogen (N) uptake of both morphologies. It was hypothesized that *Ulva* blades would uptake more N due to their greater surface area:volume ratio.

II. Methods and Materials**

All glassware and natural seawater (NSW) were sterilized. NSW was pH adjusted to 8.3. Von Stosch enrichment media, freshwater with germanium dioxide, and cotton swabs were used to gently rinse and clean *Ulva*. Nutrient media had 4mg/L concentrations of sodium nitrate ($NaNO_3$) and ammonium chloride (NH_4Cl) respectively. Samples were incubated in NSW for 1 hour before the experiment.

The experiment took place at noon in the Brooklyn College greenhouse on a summer day. There were 30 200mL/250mL Erlenmeyer flasks that each contained 100mL of nutrient media and 1g of *Ulva* (except controls). An air pump was connected to plastic tubing and glass pipettes and one pipette was placed into each flask. 2mL water samples were taken from each flask at 0 and 25 min with a micropipette and were tested for NO_2/NO_3 and NH_3 on a Seal discrete nutrient analyzer, which were added together to find DIN. Initial and final DIN values were subtracted to produce uptake data.

III. Results



Average DIN uptake of the blade, tube, and control groups of both $NaNO_3$ and NH_4Cl-enriched nutrient media.

IV. Discussion and Conclusions

As seen in Fig. 1 above, *Ulva* blades uptook 28% more DIN than Ulva tubes in NH_4Cl-enriched media and 8% more in $NaNO_3$-enriched media. The NH_4Cl control showed a DIN purge of 1.10478 mg N/L, perhaps from experimental error. These results help us understand how *Ulva* obtains nutrition from JB, and factors influencing *Ulva* morphology abundance. Implementing measures to reduce anthropogenic nutrient input is an expensive endeavor that can hurt the agricultural industry, emphasizing the need for more research on cost-effective yet appropriate strategies. Monitoring the characteristics and behavior of *Ulva* provides insight on how much N is in the water, how much harm the JB ecosystem faces, and how to reverse the damage.

Acknowledgments

I would like thank to Ph.D. candidate Annesia Lamb, Dr. Branco, Tricia Bhatia, Emily Bell-Dinan, and Mrs. Baksh for their unwavering support in my research project.

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*Research supported by Brooklyn College (City University of New York) and the Rockaway Waterfront Alliance.

**The experiments conducted by Fujita et al. and Runcie et al. on *Ulva* nutrient uptake served as templates for procedural design in this study.

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