Adaptations of Eelgrass to living in Anoxic Environments

Natasha Hope Ficzycz[1], Sherryl Bisgrove[1], and Nikki Wright[2]

[1]Department of Biological Sciences, Simon Fraser University, Burnaby, B.C.

[2]SeaChange Marine Conservation Society, Brentwood Bay, B.C.

Introduction

Eelgrass (*Zostera marina*) beds create important habitats in many coastal estuaries in Canada. The species provides essential ecosystem services for invertebrates and fish including refuge, food and shelter.

Eelgrass with a sunflower star.

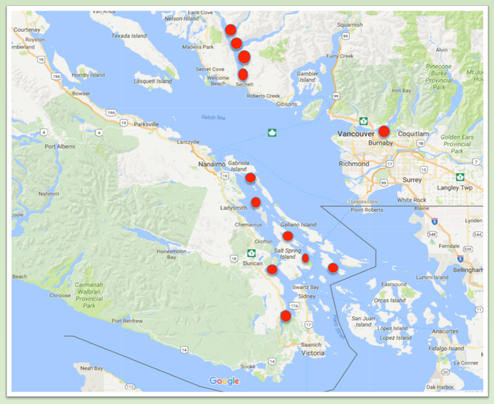
Photo credit: SeaChange Marine Conservation Society

Industrial, residential, and recreational activities have resulted in the loss of several eelgrass communities in local B.C. waters. In particular, forestry practices in British Columbia have created toxic environments in many areas that once housed thriving eelgrass communities. The SeaChange Marine Conservation Society is working to restore eelgrass at sites in B.C. from which it has been lost. This is done by transplanting shoots from native beds located near the restoration sites. We report here an assessment of eelgrass productivity at several of these restoration sites.

Volunteers with SeaChange Marine Conservation Society prepare eelgrass for transplanting.

Photo credit: SeaChange Marine Conservation Society

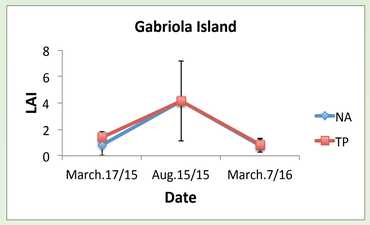
Results

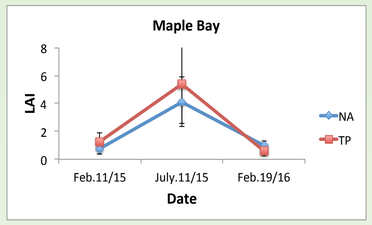


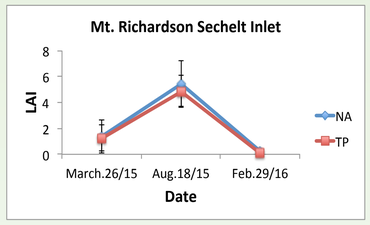
Eelgrass transplant sites in the Salish Sea.

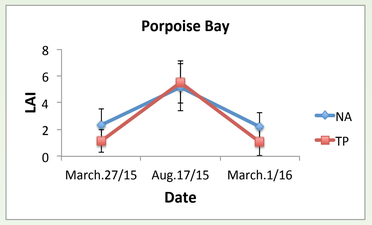
To determine how successfully eelgrass is recolonizing transplanted areas, the amount of eelgrass at each site was compared with the amount at neighboring native beds. This was done by calculating the leaf area index (LAI):

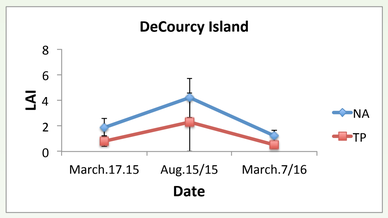
LAI = mean shoot length x mean shoot width x mean density of shoot /m^2







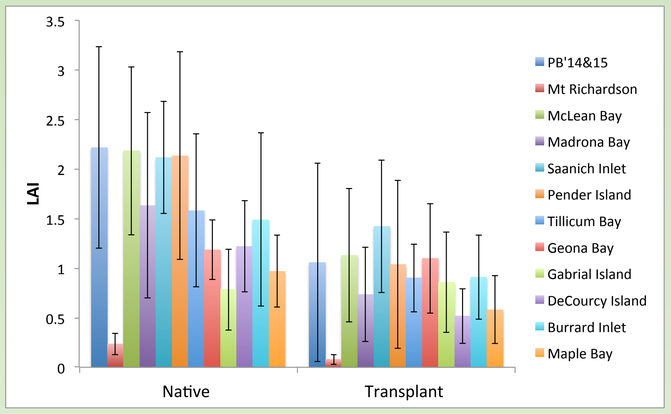




When measured in early spring and late summer, we found that LAI was significantly greater in the late summer than it was in the early spring, consistent with a cycle in which eelgrass productivity increases in the spring/summer months and decreases in the winter.

Eelgrass associated with both native and transplanted beds had similar LAI values and followed the same seasonal trends, suggesting that the re-colonization by transplants at these sites was successful.

LAI's were obtained for additional sites during the winter of 2016.



LAI's were similar at eleven of the sites. However, there was significantly less eelgrass at Mt Richardson. Historic beds at Mt Richardson were exposed to log booming activities.

Future Directions

Marine sediments at sites with large amounts of wood waste are anoxic and high in H_2S. This phytotoxin is produced by bacteria that use sulfate from the seawater as an electron acceptor during the breakdown of organic compounds. This creates an anoxic environment in the sediment. Eelgrass can adapt to growth in anoxic environments by developing large air spaces or lacunae in tissues called aerenchyma. These large air spaces increase oxygen diffusion from sites of photosynthesis in the leaves to the rhizomes buried in the sediment.

To find populations of eelgrass that might be more adapted to growth in anoxic environments, we will sample sediment and eelgrass plants, when present, from pristine and sites that are associated with high log booming activities. We expect to find a correlation between the amount of hydrogen sulphide in the sediment and the size of lacunae if the eelgrass is adapted to growth under these conditions.

Acknowledgements

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